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ADVANCED GREEN HOUSE AUTOMATION USING GSM BOARD

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Abstract—
our Agriculture is an important part of human life. Many studies have been carried out to im prove greenhouse/environment monitoring and control, which will help solve important probl ems related to agriculture in order to increase the yield grown throughout the year. While the comfort of a small space like a home is ensured, human intervention is also minimized in a s mall greenhouse environment. Therefore, it is necessary to monitor the greenhouse and contr ol the system only for the purpose mentioned above. The method used to create a greenhouse monitoring system is wired connection. The system is built using many cables, sensors, LCD, power conditioner, power bank, LED, LDR, Arduino board and others. The result is a high p erformance for the maintenance of the greenhouse environment.

Keywords—Greenhouse, Monitoring and Control, Arduino.

INTRODUCTION (HEADING 1)

At this point everything can be monitored and controlled. Unfortunately, manual processes ar e still very strong in important sectors such as agriculture, which means that the maintenance and management of greenhouses is not yet widespread, especially in small farming.The reaso n why greenhouse automation cannot be fully implemented may be due to many factors such as lack of technical knowledge, high cost and high maintenance.Since the first civilizations of humanity, agriculture has been one of the most important activities for humans, and unfortun ately even today the impact of human intervention in agriculture is impossible. It is an import ant part of agriculture when it comes to greenhouse monitoring and control systems because i t can be used to obtain plant products for the purpose of growing plants in climate control[1], it is also very important in agriculture. It apparently controls the environment, protecting plan ts from the weather, extending the growing season, and also allowing you to plant plants first and harvest them later [2].Within the scope of this project, there will be a greenhouse that wil l take part in the management and monitoring of the system in the weather conditions require d for agriculture.

II. ENVIRONMENTAL FACTORS

A. Temperature

Regarding temperature, Asolkar said that temperature is an important environmental factor an d is associated with the growth of plants. Therefore, it is very important to control and monito r the temperature in the greenhouse environment, and with the help of greenhouse technology , this becomes easier. A more detailed explanation can be explained that plants produce heat when they absorb carbon dioxide and exhale. The heat produced can help plants like tomatoe s grow, but when the heat becomes too much without proper ventilation it can cause crop dise

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ases. To prevent this, temperature control can be used to lower the temperature to help the pla nt stay at a suitable temperature for a good harvest [4].

A. Humidity

Humidity: As humidity increases, plants remove oxygen and produce carbon dioxide, which c auses the greenhouse to become humid after a while. With proper ventilation and proper heat management, moisture that will inhibit plant growth can be prevented. If these two issues are not met, the greenhouse may harbor diseases and mold growth may harm the cultivated plants [4]. CO2 concentration is important for plant growth [3]. Carbon dioxide is needed for photo synthesis, the process by which plants produce their own food. Carbon dioxide is obtained fro m air or water. During photosynthesis, plants use carbon dioxide to produce carbohydrates, w hich supports plant growth [4].

C. Sunlight

Sunlight: For plants, some like full sun and some like some shade. Choosing the right helper f or your greenhouse based on this information will help you control the amount of sunlight it r eceives [4].

III. REVIEW OF LITERATURES

Ibrahim. A. et al. [5] suggested controlling and monitoring the environment in the greenhouse . There are local stations and central stations in the system. The local station measures the am bient temperature and controls the operation of control actuators to maintain the air temperatu re at specified points. This system uses ZigBee wireless module server to communicate betwe en the local station and the central station.

Zhou.J[6] presented a framework that includes a data acquisition controller and greenhouse re mote monitoring software. Both systems require remote stations (central stations) for control.

Qiang.G et al. [7] developed a network-
based monitoring and control WSN platform for greenhouse climate monitoring. The system has 3 nodes; convergence node, wireless sensor node and wireless control node. The function of wireless sensor nodes is to collect greenhouse air data. The task of the sink is to analyze an d process data received from various sensors. The role of the control node is to manage the cli mate in the greenhouse based on the information stored in the greenhouse.

Rangan. K et al. , uses GPS modem to check and update the owner of the magazine.

Daniela. A. et al. The purpose of this process is to determine how the thermostat is used to co ntrol temperature to enable the plant to grow. The project also analyzed the reliability of the i rrigation system, that is, whether it could provide perfect humidity to the plant in question. As a result, water flow and humidity (which must be determined reliably) do not work at all, but temperature control works well, making sure that the temperature at cutting is constant for th e desired variety, vegetables and basil.

Anuradha Gaikwad[10] reported a project using ZigBee technology and Android application. Here, the system has a sensor to detect the environment, and the sensory results are sent to th

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e mobile application with the help of a computer. For example, users can turn on the fan whil e using the mobile app. Here mobile applications help reduce farmers' direct maintenance.

IV. SYSTEM ARCHITECTURE

The main purpose of this system is to create a profitable greenhouse that will reduce labor cos ts and help small farmers grow crops every year.The system consists of sensors, microcontrol lers and actuators. How the system works; When the environment does not exceed the securit y level, the sensor detects a change and reads the data from the microcontroller input port and performs the necessary work to correct the measurement to the desired level. < br>Actuators (fans, LEDs, buzzers) are turned on according to instructions passed to the microcontroller. A n LCD screen is used to show the status in the greenhouse. Finally, the entire set is user-friendly, easy to assemble, and less portable.

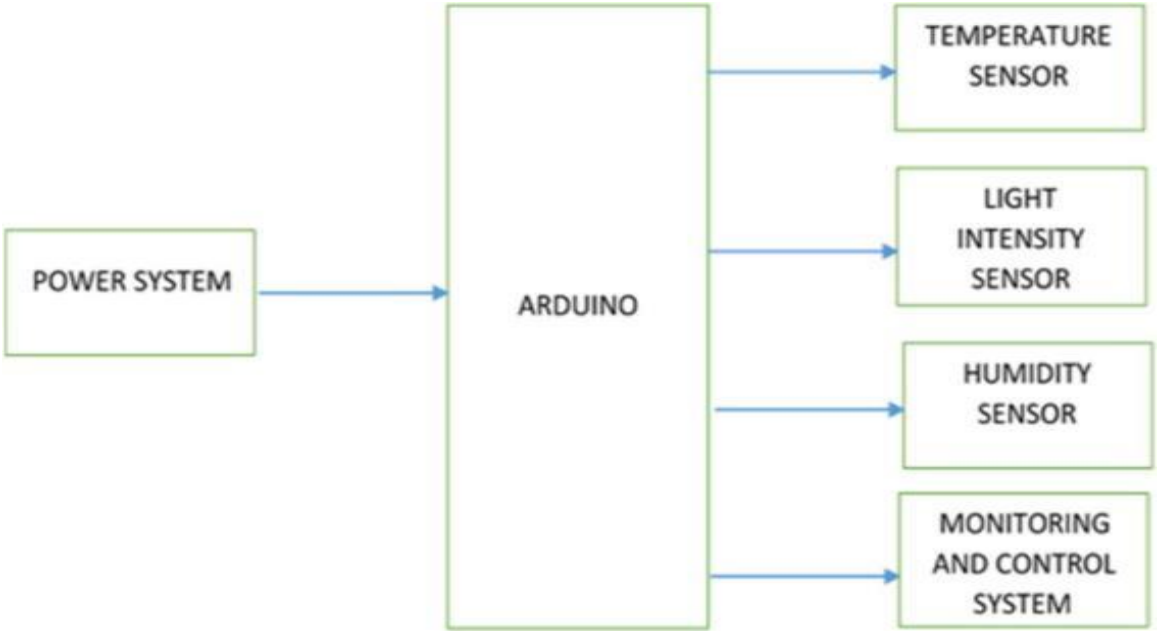

Fig 1: Green House Monitoring and Control System Architecture

A. Functional Requirement of the System

This section briefly describes the settings of the tomato varieties used in this study. Para meters

1. Users should measure the temperature suitable for tomatoes up to 27°C.
2. Users should set the appropriate value for tomatoes to 60
3%. Users should set the light intensity to 80%
4. Users need to set the CO2 level to 400.

Also the above setting helps control the greenhouse. An example can be explained as foll ows:

For temperature, humidity and light intensity, the relay will do what is required even at l ow temperatures (27°C) when the temperature is higher than the temperature sensor.), re duce the temperature by turning on the refrigerator and turn on the heater when the temp

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erature is too low. Likewise, when the humidity level rises above 60%, the heating is tur ned on.

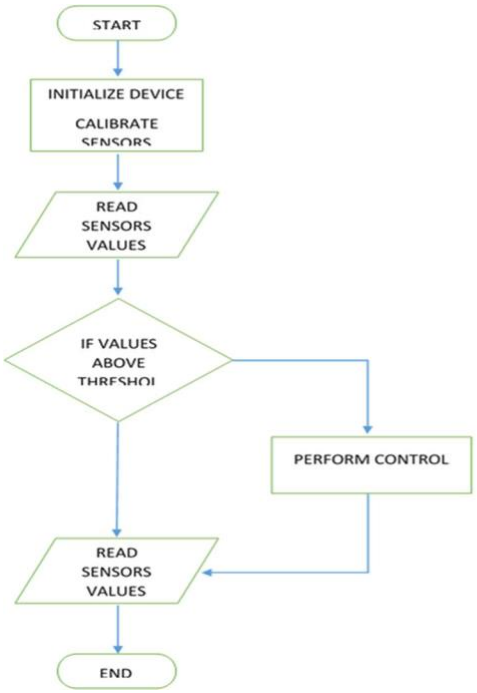
In addition, when the light intensity is fixed at 80%, the light will be turned off if the val ue seems high, which will cause the light intensity to decrease and prevent crops. This is not a good thing.

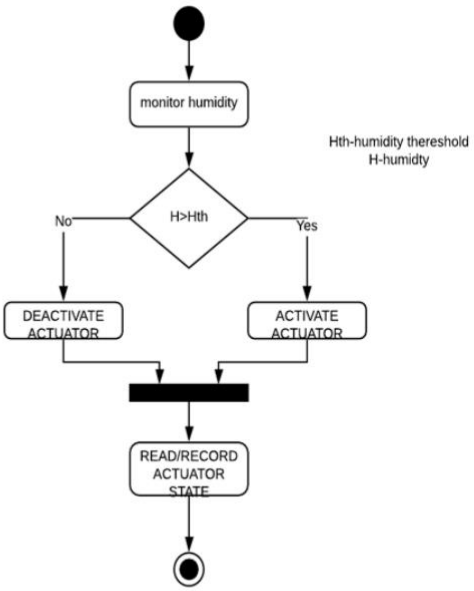
B. Programming Language

The programming language used to control microcontrollers is C/C++, which is preferre d because it is a hardware language and the main language used to program microcontrol lers (Arduino).

C. Modeling Tools

The schematic diagram is shown in figure 2.0 and the operating diagram for monitoring t emperature, humidity, light intensity and fuel level is shown in figures 3 to 6. The refere nce diagram of the greenhouse monitoring and control system is shown in Figure 7, and t he time diagram is shown in Figure 8.





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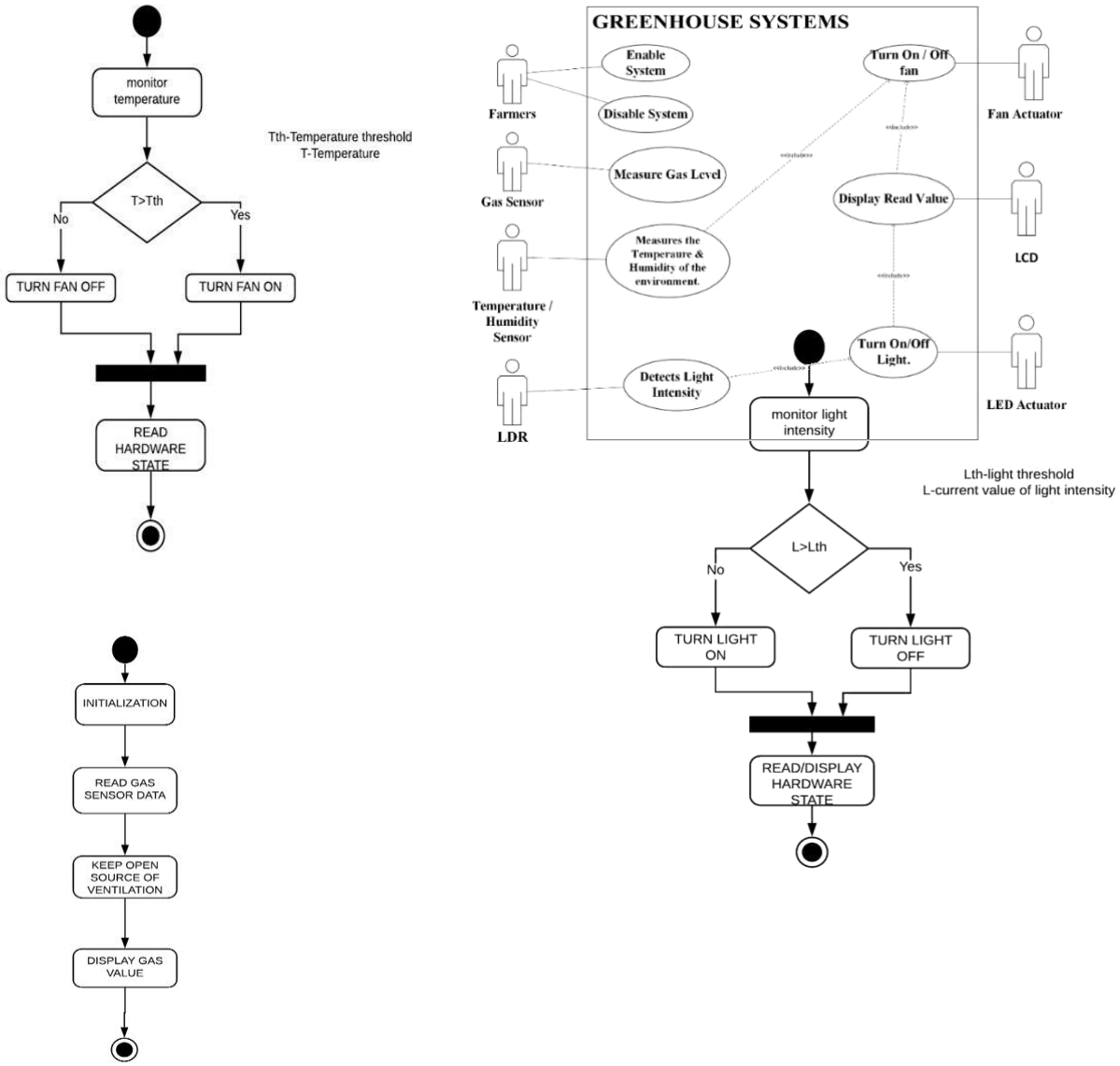

Fig 7: Use Case Diagram for the Greenhouse System

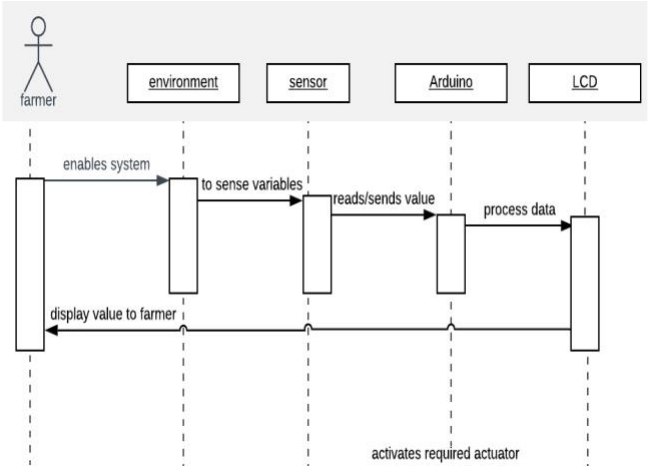

Fig 8: Sequence Diagram for the Greenhouse System

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V. HARDWARE REQUIREMENT

A brief description of the hardware used in this section is given as follows:

A. Arduino Microcontroller

Arduino consists of a physical programmable circuit board (often called a microcontroller) an d a software or IDE (Integrated Development Environment) that runs on the computer, allowi ng it to write program code and send it to the board.

C. Liquid Crystal Display (LCD)

LCD (Liquid Crystal Display) is a technology used in laptops and other small computers [12] .

C. Temperature and Humidity Sensor

The sensor used in this project is the DHT22 sensor, which is a low-
cost sensor used to measure temperature (-40 to 80°C) and humidity (0-100%).

Light Intensity Sensor

A lightemitting diode (LDR) is a component that has a resistance (uniformity) that varies wit h the intensity of light falling on it; LDR is also known as photoresistor. This allows them to be used in lighting [13].

D. CO2 Sensor

Gas Sensor (MQ2) is used to detect gas pollution in the environment.

E. Fan

Used as a cooler in greenhouse monitoring and control systems.

F.LED

They are used as indicator lights in greenhouse monitoring and control.

VI. SYSTEM IMPLEMENTATION

In order to monitor and control the greenhouse effect in terms of usage, both input devices (se nsors) and output devices (actuators) are connected to a microcontroller.Actuators specificall y respond to environmental changes (increase/decrease in temperature, humidity, light intensi ty and carbon dioxide level) in the greenhouse environment. For example, fans act as actuator s to control greenhouse ambient temperature and humidity levels, and light bulbs act as actuat ors for light intensity and carbon dioxide.

System Setup:

The greenhouse monitoring system was created by DHT11. DHT11 is a simple and lowcost d igital temperature and humidity sensor. DHT11 uses capacitive humidity sensor and thermist

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or to measure ambient temperature and output digital signal to data pin.It is very easy, but car e must be taken when capturing data. Figure 9.0 shows the connection of DHT11 to Arduino

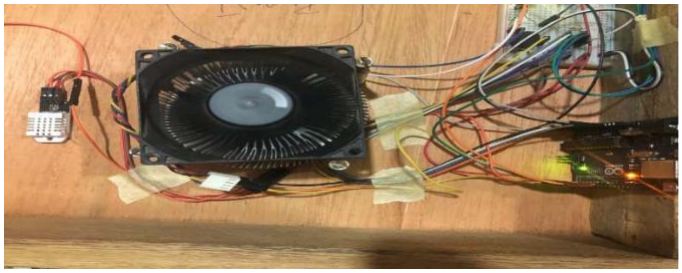

Fig 9: connection of DHT11 with Arduino

LDR has two pins to read light, LDR is connected to Arduino microcontroller in the form of voltage regulator. The connection is shown in Figure 10.0 below:

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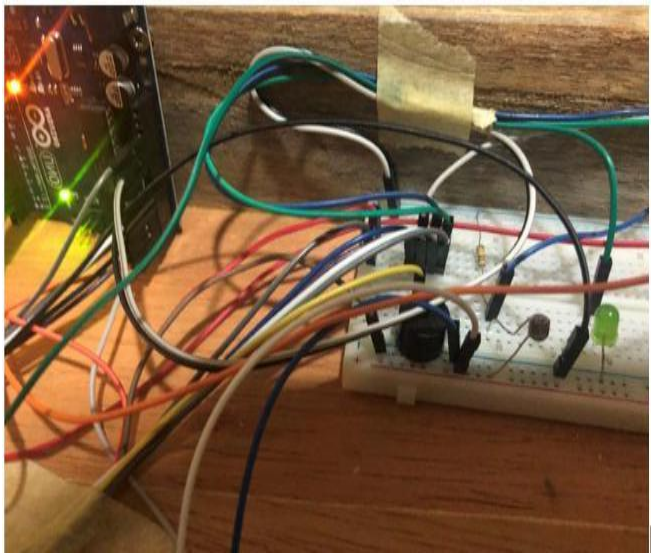

Fig10: The LDR and Arduino Connection

Q3 has three pins used to read the oil level in the greenhouse environment. The connection wi th the same chip is shown in Figure 11.0 below.

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Figure 11.0: MQ3 connection with Arduino

B. Hospital Monitoring Software Installation

Arduino microcontroller acts as the brain; It regulates the functioning of organs in the body. Arduino microcontrollers are programmed using the C programming language using the Arduino editor. The configuration of the Arduino system and other compone nts of the greenhouse monitoring system is shown in Figure 12.0:

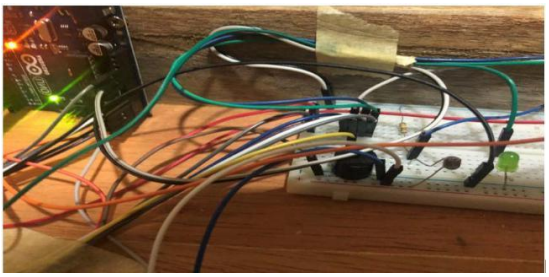
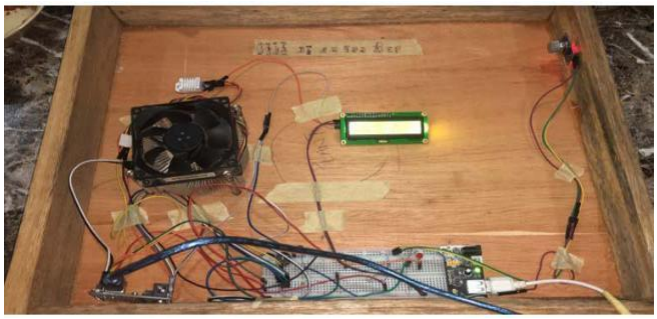


Figure 12.0: Arduino connection with the Microcontroller

VII. SYSTEM TESTING AND RESULT

Physical studies were carried out to implement the proposed strategy. Greenhouse monitoring equipment tested.Unit tests of various components of the greenhouse monitoring system hav e been completed. The purpose of this evaluation is to ensure that all elements of greenhouse maintenance are operating as designed.



A.Room temperature and humidity

The starting point of both temperature and humidity
has not changed,

has a significant impact on the construction Facility. For example, when the temperature is se t to 32°C, the sensor reads the temperature as 28.50°C and thus the greenhouse is closed.

After initially switching to 26°C, the
cooling environment of the greenhouse
is still 28.50°C and the fans are turned on, which is an indication that
the environment has cooled down. It cannot support the growth of tomatoes.
The crop needs warmth to grow.

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B. Gas unit test

Then the unit test is done at Gas level. Light the lamp and place it near the smoke detector.

Therefore, the oil level is higher than the threshold and causes noise.

C. Light usage measurement unit

Finally, the measurement unit measures light usage. The unit is divided into two parts. First, t he photoresistor is blocked, causing the light intensity to drop below the threshold, and the lig ht source LED allows the light to shine. In the second one, when the LED light turns on, exter nal light (flashlight) is entered into the greenhouse. The LDR sensor causes the light intensity to be higher than set, so the LED turns off.

VIII. Discussion

This research has been done and the aim is to determine how IoT can help small farmers gro w crops in a good environment with very limited resources every year. Research shows that when fully implemented, the system can also increase agricultural yields by managing individ ual inputs to increase yields and reduce farmer involvement. To develop this system, sensors (temperature, humidity, light sensors and gas sensors) were integrated into the system to unde rstand the changes occurring in the greenhouse environment. In the case of sensors, appropria te actuators are turned on or off when a setting does not exceed the safety limit. For this syste m, the Arduino board is the brains of the system, along with the code that loads and controls t he actuators. LCD shows the value read by the reading sensor. There is an air conditioner in t he system whose purpose is to reduce the temperature and stop when the temperature reaches the desired range. The power source of the system is electrical power. One of the limitations of using a greenhouse monitoring and control system is the inability to track water usage. In f uture studies, the water system will be integrated with the greenhouse system. A small sprinkl er will provide integration and impact to the greenhouse.

IX. Conclusion

A greenhouse monitoring system can monitor changes in temperature, humidity, light intensit y and fuel levels in the greenhouse. Various sensors can trigger actuators based on various ch anges in the environment. This research paper is designed to promote the simplicity and ease of growing plants among small farmers. The plan will allow small farmers to grow healthy cr ops year-round with minimal maintenance.

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