GREENHOUSE MONITORING USING ARDUINO PLATFORM

Vidhya Shree A[1], Supriya R[2], Gayathri J[3]

[1] *Student, Electronics and Communication Engineering, Prince Shri Venkateshwara Padmavathy Engineering College, Tamil Nadu, India*
[2] *Student, Electronics and Communication Engineering, Prince Shri Venkateshwara Padmavathy Engineering College, Tamil Nadu, India*
[3] *Assistant Professor, Electronics and Communication Engineering, Prince Shri Venkateshwara Padmavathy Engineering College, Tamil Nadu, India*

ABSTRACT

An indoor climate is closely related to human health, well-being and comfort. Thus, indoor climate monitoring and management are prevalent in many places, from public offices to residential houses. It is shown that an active plant wall system can effectively reduce the concentration of particular matter and volatile organic components and stabilize the carbon dioxide concentration in the indoor environment. However, regular plant care is restricted by geography and can be costly in terms of time and money, which posses a significant challenge to the wide spread development of plant walls. The remote monitoring and control system is proposed. That is specific to the plant walls. The system utilizes the Internet of Things Technology and the public cloud platform to automate the management procedure. Improve the scalability, enhance the user experience of plant walls, and contribute to a green indoor climate. Greenhouse monitoring and controlling is a complete system design to monitor and control the humidity inside a greenhouses. This concept places an IoT monitoring auto power supplying system phone, connected using Wi-Fi to a central server which connects via serial communication to a microcontroller and humidity sensor.

Keyword: *IoT, cloud, Indoor climate, Arduino, Greenhouse monitoring.*

1. INTRODUCTION

An embedded system is one kind of a computer system mainly designed to perform several tasks to access, process, store and also control the data in various electronics-based systems. Embedded systems are a combination of hardware and software where software is usually known as firmware that is embedded into the hardware. One of its most important characteristics of these systems is that it gives the o/p within the time limits. Embedded systems support to make the work more perfect and convenient. So, the embedded systems are frequently used in simple and complex devices too. The applications of embedded systems mainly involve in our real life for several devices like microwave, calculators, TV remote control, home security and neighborhood traffic control systems.

1.1 Agriculture

The agriculture industry faces a need to transform from the traditional production-oriented method to a new value chain-oriented approach. Information and communication technologies should be employed to create high-value markets and maintain international competitiveness. Greenhouse conditions for crop culturing can therefore be optimized via real-time analysis and control of factors such as shade and water. This technology has been field tested and verified in greenhouse cultures. The system is highly customizable and features low operating costs, easy operation, and remote control capability. It can assist farmers in automating their crop production management and improving the quality of productivity.

1.2 Technology Development in Agriculture

Modern farms and agricultural operations work far differently than those a few decades ago, primarily because of advancements in technology, including sensors, devices, machines, and information technology. Today's agriculture routinely uses sophisticated technologies such as robots, temperature and moisture sensors, aerial images, and GPS technology. These advanced devices and precision agriculture and robotic systems allow businesses to be more profitable, efficient, safer, and more environmentally friendly.

2. PROPOSED DESIGN

The overall system consist of Arduino UNO has a heart of this system which can process all the instructions which is interfaced with sensor, camera and all are connected through IOT. By using cloud software, the system displays temperature, humidity, moisture, LDR and many features are included through Arduino programming refer Figure 5.1.

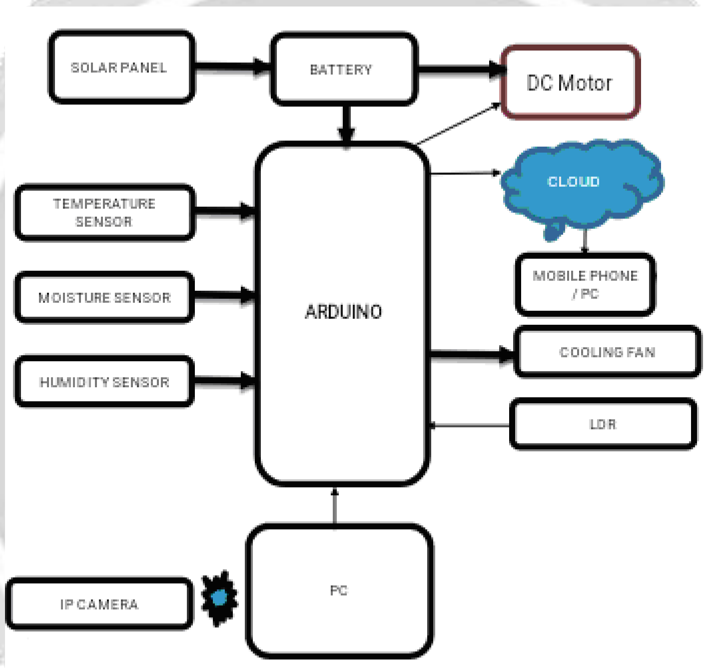

Fig -1: Block diagram

Arduino UNO is a microcontroller board developed by Arduino.cc which is an open-source electronic platform mainly based on AVR microcontroller. The current version of Arduino UNO comes with USB interface, 6 analog input pins 14 I/O digital ports that are used to connect with external electronic circuits out of 14 I/O ports, 6 pins can be used for PWM output. It allows the designers to control and sense the external electronic devices.

The board comes with all the features required to run the controller and be directly connected to the computer through USB cable that is used to transfer the code is for the use to the controller using IDE (Integrated Development Environment) software, mainly developed to program Arduino. IDE is equally compatible with Windows, MAC or Linux Systems, however, Windows is preferable to use. Programming languages like C and C++ are used in IDE.

Apart from USB, battery or AC to DC adopter can also be used to power the board. Arduino Uno boards are quite similar to other boards in Arduino family in terms of use and functionality. However, UNO Boards don't come with FDTI USB to Serial Driver Chip. There are many versions of Uno Boards available; however, Arduino

Nano V3 and Arduino Uno are the most official versions with Atmega328 8-bit AVR Atmel microcontroller where RAM memory is 32KB.When nature Vs functionality of the task go complex.

3. SMART FARM

Smart farming and precision agriculture involve the integration of advanced technologies into existing farming practices in order to increase production efficiency and the quality of agricultural products. As an added benefit, they also improve the quality of life for farm workers by reducing heavy labor and tedious tasks.

Every aspect of farming can benefit from technological advancements—from planting and watering to crop health and harvesting. Most of the current and impending agricultural technologies fall into three categories that are expected to become the pillars of the smart farm: autonomous robots, drones or UAVs, and sensors and the Internet of Things (IoT).

4. AUTOMATED WATERING AND IRRIGATION

Subsurface Drip Irrigation (SDI) already shows how much water their crops receive. By pairing these SDI systems with increasingly sophisticated IoT-enabled sensors to continuously monitor moisture levels and plant health, farmers will be able to intervene only when necessary, otherwise allowing the system to operate autonomously. While SDI systems are exactly robotics, they could operate completely autonomously in a smart form content relying on data from sensor around the fields to perform the irrigation which is needed.

5. CONNECTIONS FROM SENSOR AND IoT

Innovative, autonomous abbots and drones are useful, but what will really make the future farm a “smart farm” will be what brings all this technology together: The Internet of Things.

The IoT has become a bit of catch-all term for the idea of having computers, machines, equipment and devices of all types connected to each other, exchange data, and communicating in ways that enable them to operate as a so-called “smart” system. We’re already seeing IoT technologies in use in many ways, such as smart home devices and digital assistants, smart factories and smart medical devices.

Smart farms will have sensors embedded throughout every stage of the farming process, and on every piece of equipment. Sensors set up across the fields will collect data on light levels, soil conditions, irrigation, air quality and weather.

That data will go back to the farmer, or directly to Abbots in the field. Teams of robots will traverse the fields and work autonomously to respond to the needs of crops, and perform weeding, watering, pruning and harvesting functions guided by their own collection of sensors, navigation and crop data. Drones will tour the sky, getting the bird’s eye view of plant health and soil conditions, or generating maps that will guide the robots, and help the human farmers to plan for the farm’s next steps. All of this will help to create higher crop production, and an increased availability and quality of food as shown in figure 3.3.

BI Intelligence shared their predictions that IoT devices installed in agriculture will increase from 30 million in 2015 up to 75 million by 2020. Under this trend, connected farms are expected to generate as many as 4.1 million data points each day in 2050—up from a mere 190,000 in 2014.

This mountain of data and other information generated by farming technology, and the connectivity enabling it to be shared, will be the backbone of the future smart farm. Farmers will be able to “see” all aspects of their operation in which plants are healthy or need attention, where a field needs water, what the harvesters are doing and make informed decisions.

And this discussion has only touched on the tip of the proverbial iceberg with the focus on vegetative crops; there is an equal groundswell of smart technology adoption for animal husbandry, and many more drones and robots for every aspect of farming. If every farm in the country becomes a smart farm, reaching that 70 percent increase in food production is a certainty.

6. RESULTS

6.1 WI-FI CONNECTION TO RUN THE PROGRAM

The line 1 in Figure 6.1 shows the password of Wi-Fi setup. The second line shows the Wi-Fi connection to start the program. Here, the server gets started after the connection of Wi-Fi setup.

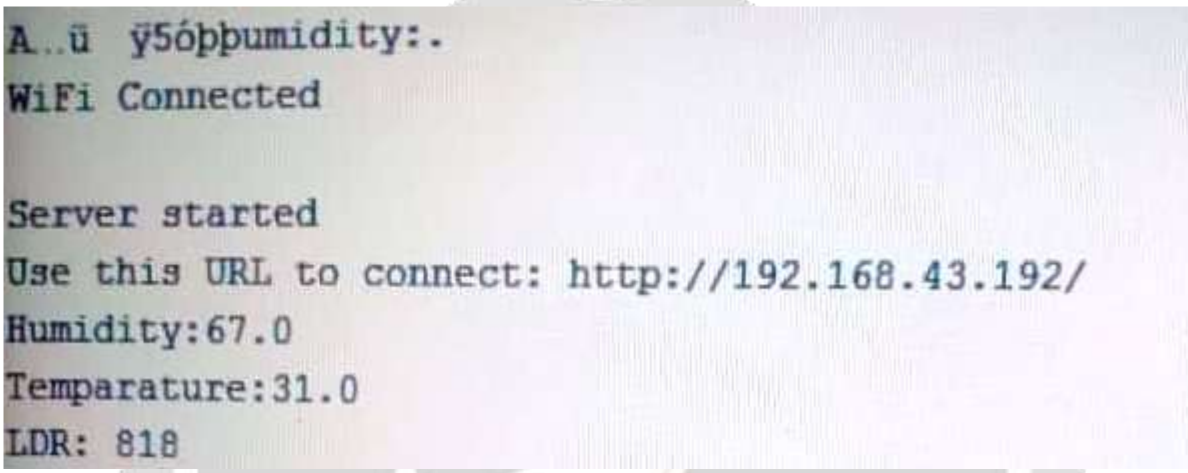

Fig -2: Wi-Fi Connected

6.3 VALUES OF HUMIDITY SENSOR

In the Figure 6.3, the humidity value varies according to atmospheric conditions and the temperature remains constant. When the temperature increases, the humidity decreases and when the humidity increases, the temperature decreases.

Fig -3: Output of Humidity Sensor

6.4 VALUES OF TEMPERATURE SENSOR

The Figure 6.4, shows the value of temperature senor remaining constant according to atmospheric conditions. When the temperature increases above a particular value of instant, the fan automatically switches ON.

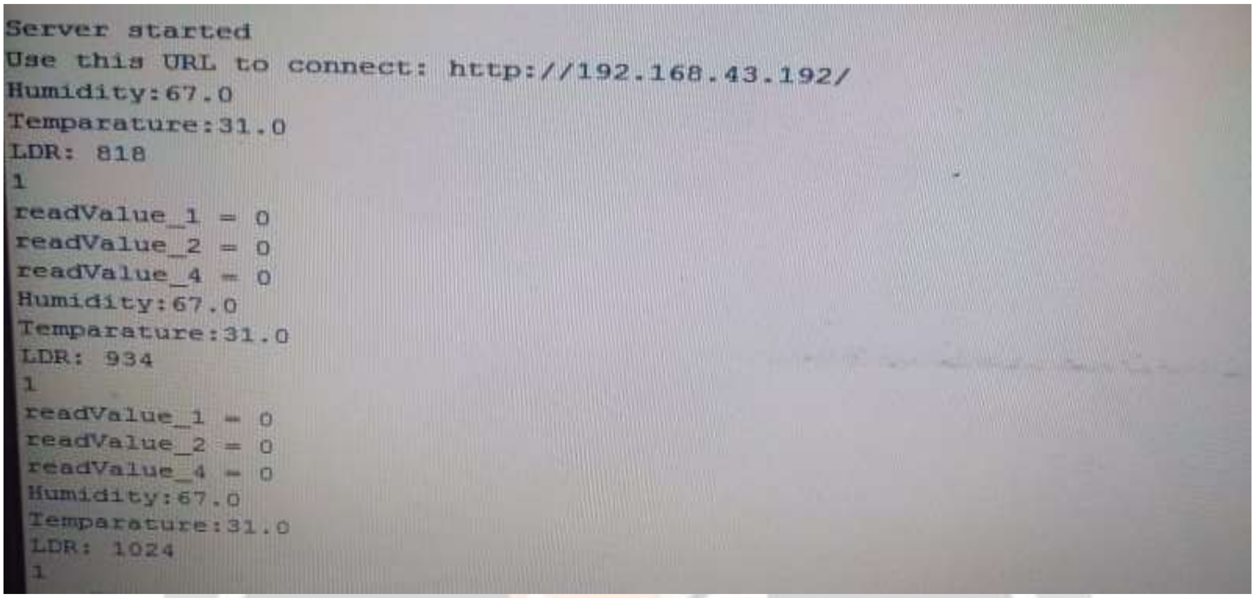

Fig -4: Output of Temperature Sensor

6.6 FINAL OUTPUT

Fig 6.6 shows the output of humidity, temperature and moisture sensors.

Fig -5 Final Output of the System

4. CONCLUSIONS

A step-by-step approach in designing the microcontroller based system for measurement and control of the four essential parameters for plant growth, i.e. temperature, humidity, soil moisture, and light intensity, has shown that the system performance is quite reliable and accurate. This will reduce the time of using the manual way of watering. Fewer workers are needed to maintain the plants or crops. The sensors such as temperature sensor (Thermistor) and soil moisture probe are used to control the temperature and watering in the greenhouse. The system has successfully overcome quite a few shortcomings of the existing systems by reducing the power consumption, maintenance and complexity, at a reduced cost and at the same time providing a flexible and precise form of maintaining the environment. A step-by-step approach in designing the microcontroller based system for measurement and control of the four essential parameters for plant growth, i.e. temperature, humidity, soil moisture, and light intensity.

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