Environment Adaption Technology for Indoor large Scale Farming

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Abstract

It is a well-known situation that nowadays people are opting for organic food grown in an ecological way to reduce carbon footprint and damage to the environment. Ecology is suffering because of the use of pesticides and crop protection chemicals due to the damage caused to the flora and fauna in the environment where the crops are being cultivated. Combined with this, people are trying to get the freshest vegetables, fruits, and even flowers. Because of these situations, it is more common nowadays to find people trying to grow their food, or plants that they can't get in the place they live. Vertical farming is the practice of producing food and medicine in vertically stacked layers, vertically inclined surfaces or integrated in other structures such as in a skyscraper, used warehouse, or shipping container, terrace etc. The project implements optimum uses of resources such as land and water so that maximum output can be achieved to overcome the food scarcity in future by creating an Artificial Indoor Environment to protect the crops from being damaged and by introducing Hydroponic system, we can cultivate crop without the requirement of soil.

Keywords: Hydroponicsystem, NFT, IOT

1. Introduction

Hydroponics is the cultivation of plants without using soil. This system fosters rapid growth, stronger yields, and superior quality. When a plant is grown in soil, its roots are perpetually searching for the necessary nutrition to support the plant. If a plant's root system is exposed directly to water and nutrition, the plant does not have to exert any energy in sustaining itself, instead energy of the roots would have expended in acquiring food and water can be redirected into the plant's maturation. Hydroponic systems work by allowing minute control over environmental conditions like temperature and pH balance and maximized exposure to nutrients and water. Hydroponics operates under a very simple principle: provide plants exactly what they need when they need it. They allow you to control exactly how much light the plants receive and for how long. pH levels can be monitored and adjusted. There are many different types of Hydroponic systems; we are using Nutrient Film Technique (NFT) Systems. Plants are grown in channels that have a nutrient solution pumping through them and constantly running along the bottom of the channel. When the solution reaches the end of the channel, it drops back into a main reservoir and is sent back to the beginning of the system again. This makes it a recirculating system, just like deep water culture. This system can support vertical farming based on hydroponics to increase the yield of farming , and enable IOT so user can control from throughout globe.

2. Methodology

With the help of sensor, water pump, air circulating fan, heater, actuator by writing embedded C code and blynk iot platform the desired system has been setup. Humidity measurement determines the amount of moisture present in the gas that can be a mixture of water vapor or other gases. We are using DHT11 sensor, it is a low-cost digital sensor for sensing temperature and humidity. This sensor can be easily interfaced with any micro-controller such as Arduino, Raspberry Pi, ESP 32 to measure humidity and temperature instantaneously. DHT11 humidity and temperature sensor is available as a sensor and as a module.The difference between this sensor and module is the pull-up resistor and a power-on LED. DHT11 is a relative humidity sensor. To measure the surrounding air this sensor uses a thermistor and a capacitive humidity sensor.

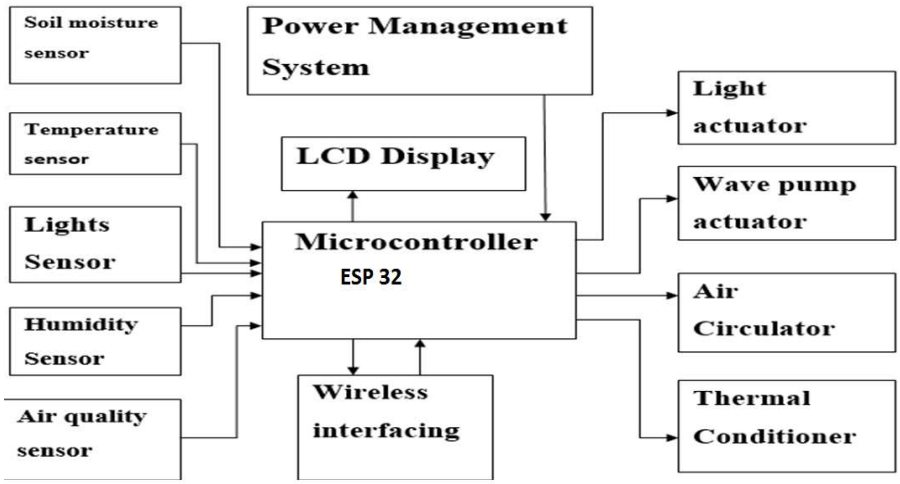

Figure 1. Block Diagram

2.1 Hardware

ESP32:: The ESP32 is the name of a micro controller designed by Espressif Systems. Espressif is a Chinese company based out of Shanghai. The ESP32 advertises itself as a self-contained WIFI networking solution offering itself as a bridge from existing micro controllers to WIFI

Soil Moisture Sensor: The Soil Moisture Sensor uses capacitance to measure the water content of soil. Simply insert this rugged sensor into the soil to be tested, and the volumetric water content of the soil is reported in percent. This sensor is needed to detect the amount of water level in the soil for monitoring proper health of the plant, whether it needs water or not is determined accurately. Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture re-

quires removing, drying, and weighing of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.

Humidity And Temperature Sensor: These sensors are required to detect the humidity of the atmosphere as well as detect the ambient temperature of the surroundings for proper monitoring of the plant health and maintaining it accurately, we use DHT22 sensor which has 2 in 1 feature which is good value for money option for us. The DHT22 is a basic, low-cost digital temperature and humidity sensor.

Air Quality Sensor: This sensor is required to measure the quality of the surrounding air which might affect the factors resulting in a change in plant health behavior. The MQ135 sensor can sense NH3, NO_x, alcohol, Benzene, smoke, CO2 and some other gases, so it is perfect gas sensor for our Air Quality Monitoring Project. When we will connect it to Arduino then it will sense the gases, and we will get the Pollution level in PPM (parts per million)

3. Working Principle

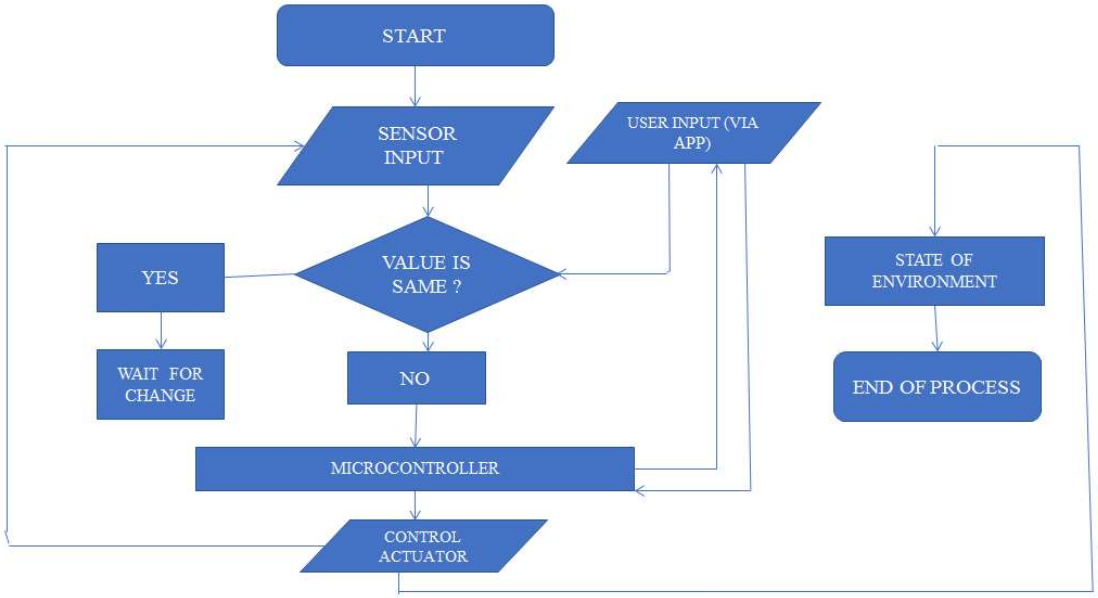

Figure 2. Flow Chart

4. Results & Discussion

Results are shown below for temperature & soil moisture sensor along with IOT.

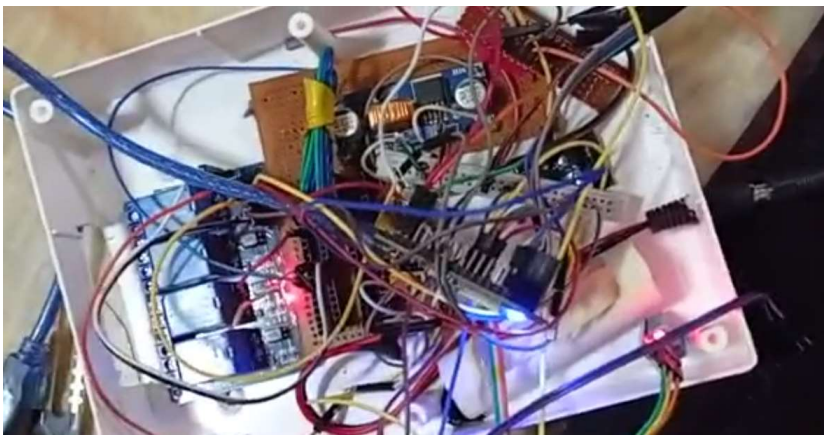

Figure 3. Hardware Construction

Figure 4. Sensor Output

Figure 5. Results on LCD and Blynk app

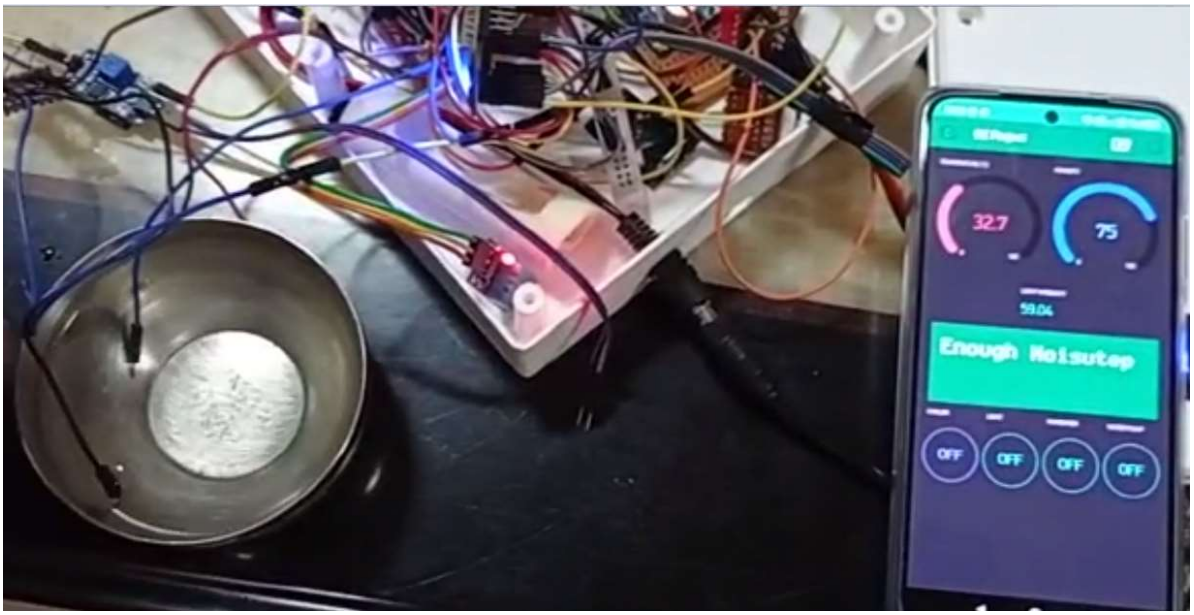

Figure 6: Soil Moisture results

5 Conclusion

In any toughest condition, however the external environment is it will help to survive plants. System is user friendly and fully automatic but if user wants to control some environment parameters then user can control via smartphone platform. It is possible to farming in low space. It can produce many benefits, both commercially and environmentally. More different types of vegetables can also be grown rather than green leafy vegetables, by adding the different nutrients and different pH values. It can be placed and operated in any of the environmental conditions.

References

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