

IOT Based Automatic Hydroponics Control and Monitoring System

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Abstract: Hydroponics is growing the plants by using only water and without using soil by all the fulfillment of nutritional needs of plants. Deep Flow Technique (DFT) is a method in which nutrients flow continuously leading to plant roots being saturated throughout. It is a sub type of hydroponics. A common problem experienced by DFT is the absence of proper caretaking of elements required for growth of plant. These include proper circulation of water, intensity of light, optimal temperature as well as humidity and also pH (water) which allow the plants to grow properly. After that it is required to check and control the water circulation on DFT-based IoT hydroponics to predict changes in plant growth factors. Data on plant growth elements are acquired by sensors integrated with Microcontroller. In the observation process it will show result on plant growth elements in the terms of variables of TDS, temperature, pH and water level in the hydroponic reservoir. From the results of the tests that have been carried out, the Control system can monitor plant growth elements displayed on the website in real time to control water and different important factors automatically.

Keywords — DFT, Hydroponics, Microcontroller, PH(Water) , TDS

I. INTRODUCTION

“With the advances in technology and the improvement of people's living standards, hydroponic plants have become an integral part of daily life.”[1] However, traditional plant farming has been mainly performed in the soil. It is known that a range of drawbacks can be found out for such a method. For an instance, regular watering and fertilizing may require more time and labor. With the development of various techniques, the soilless cultivation has become more mature and popular breeding choice such as hydroponic. Hydroponic is an environment-friendly system to cultivate crop without soil by utilizing aquaculture and hydroponics [2,3].

At present, hydroponics cultivation is mainly used in agricultural production. Plants need watering and sunlight frequently. The whole process is difficult. Based on the above shortcomings, the automatic control system is proposed [2]. Sadly, present programmed control framework isn't consistent, some surprising flaws happen, particularly it is hard to understand the remote observing and control. Thus, it is extremely compulsory to plan a keen screen and control framework, particularly for individuals who travel regularly. The fast advancement of sensor, Internet, correspondence and PC innovation, brilliant way of life will turn into a famous pattern in our future. To address the current inadequacy, this review plans a brilliant screen and controlling framework, which can make it simple to execute the association of observing field and to remote checking focuses. This framework can screen the climate through sensors in an ongoing and exact manner, and afterward definitively, naturally communicate the crude

information upsides of temperature, moistness, light power, water level and pH level. Aquaculture is more effective in regions that are restricted green space. This makes aquaculture a metropolitan farming arrangement. Both are on a modern scale and home scale for self-utilization.

“One type of hydroponics is Deep Flow Technic is a type of hydroponics that implements a continuous flow of nutrients and there is a pool of half of the diameter of the pipe that inundates the roots of the plant.”[3] The DFT system aims to make the absorption of nutrients from plants more optimal. Special focus needs to be given to the developing factors of hydroponic plants in order to produce good and healthy plants. Tank-farming plant development components as water course, light force, temperature, stickiness, TDS and pH of water. Frequently the aqua-farming activists fall flat during the plant development measure, because of absence of support of plant development components that influence the plant to shrink, to change the shade of the plant passes on to yellow, to death. With so many plant growing elements, to make it easier to know the condition of the plant, it is necessary to monitor these elements regularly [3,4].

The advancement of correspondence innovation is presently expanding quickly with the coming of the term Internet of Thing (IoT). IoT permits all items to speak with one another through the web. The IoT idea can be applied to both customary horticulture (soil media) and tank-farming agribusiness. In this final project will design and build a Control system based on the needs of hydroponic plants. The system has been designed to control the movement of DFT hydroponic systems and monitor the development of hydroponic plants which includes TDS, temperature, humidity, pH and high water in hydroponic .

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II. OBJECTIVES

1. To study the hydroponics farming along with related aspects.
2. To design and implement hydroponics Control system using IoT for monitoring and control different parameters which include pH level, nutrients present in water, temperature as well as humidity.
3. To provide real time access of the hydroponics system on mobile app or Things peak to monitor and improve crop yield.
4. We are aiming to design a Control System for hydroponics which automatically control the various important parameters and these parameters can be accessed from anywhere and on any device with the help of IOT[4].

III. METHODOLOGY

Growing with hydroponics comes with many advantages, the biggest of which is a greatly increased rate of growth in your plants. [5]

Idea that would control the parameters automatically, also the cultivators can know the current conditions of the plants growth and control the parameters remotely using IoT technology.

Firstly collection of some values from hydroponics solution such as—

- pH of water
- TDS of water
- Temperature and Humidity of water

These values are collected by using

• nutrients in solution of hydroponics fig (1). For regulating the pH level and TDS, mini water pump are pH water sensor

- Analog TDS Sensor/Meter for Arduino
- DS18B20 temperature sensor

Now designing a solution control mechanism which automatically maintain pH, TDS and other required. Each motor is connected separate solution container. And these container contain respective solutions as :---

- pH up solution (for decreasing the pH level)
- pH down solution (for increasing the pH level)
- Mixture of all nutrients which is fixed for a particular crop (for increasing TDS of water)
- Water (for decreasing TDS of water)

These pumps are controlled by Relay Module with the help of microcontroller fig(2) it can be accessed from anywhere by using either Think speak or application development. And this Control system gets inputs from probes of pH sensor, TDS sensor and water temp sensor. Then Control system will release solutions with the help of mini pumps to maintain these entire factors according of crop and environment for maximum yield [7]. And the whole working can be monitored and controlled from anywhere. The primary structure design of the system has been assembled and the required parameters to build an automatic system were planned in order to select the

required components.

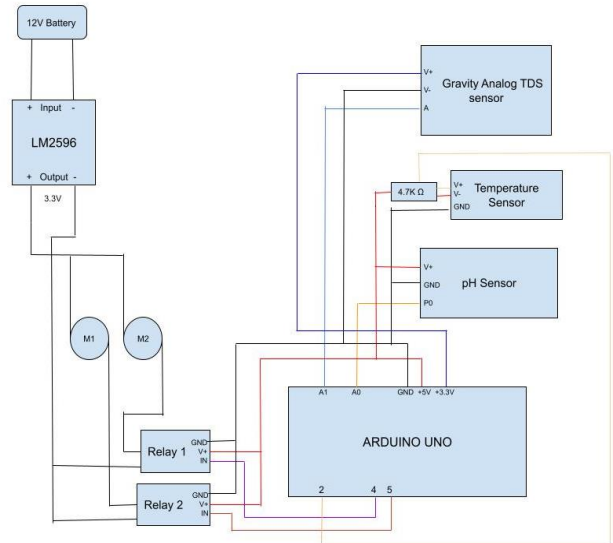


Figure 1: Block diagram of control system

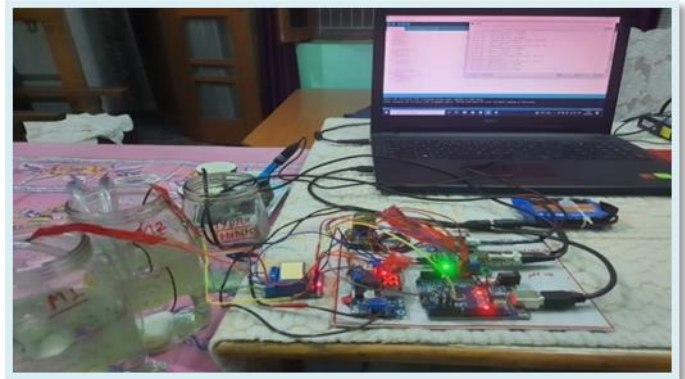


Figure2: Control mechanics of hydroponics with microcontroller

It was observed that the plants grown by controlled hydroponic method gave better results compare to normal growing technique.fig(3) ,fig(4).



Figure3: Hydroponics without control and monitoring system.



Figure4: Hydroponics with control and monitoring system.

IV. CONCLUSION

The center of an aqua-farming framework is to keep up with and control the natural boundaries and the productive stockpile of nourishment and water for sound development of the plants. In this undertaking, a practical computerized aquaculture framework utilizing IoT stage was made and it was seen that the plants filled in a supplement arrangement developed up to 25 percent quicker and conveyed up to 30 percent more yield than plants filled in soil. The plan of the aquaculture framework was chosen dependent on an examination with different plans as far as expenses, proficiency, and reasonableness to work in little indoor space. The boundaries of the framework were contemplated and determined like the appropriate temperature, pH, TDS and the necessary measure of water for the framework. At long last, The Values were shown utilizing the chronic screen. Aquaculture developing has certain intrinsic advantages[5,6].

- Measure water conditions: pH, TDS, temperature, level, and stream.
- Measure cools: temperature, stickiness and so on
- Control siphons to apportion explicit volumes of arrangements: corrosive, base and supplements.
- Automatically change water to target pH range by apportioning corrosive/base arrangements.
- Automatically change water to target electrical conductivity range by apportioning supplement arrangements.
- Alert notices if select estimations fall outside adequate reaches (e.g., temperature excessively high, water level excessively low, water stream has halted, and so forth)

Future Prospects

House Gardening:- Hydroponically developed food sources not just taste better and are more wholesome, we can change the properties of our food, screen what goes into our food and dirties less.

Exploration:- Hydroponic frameworks have been used as one of the standard techniques for plant science research and are additionally utilized in business creation for quite a long time, including lettuce and tomato. Inside the plant research local area, various tank-farming frameworks have

been intended to concentrate on plant reactions to biotic and abiotic stresses.

Developing Medicinal Plants:- Medicinal plants are progressively developed on a business scale to fulfill the enormous interest for regular cures

Plant Nursery:- Plant nursery can be made utilizing aquaculture framework. Nurseries and nurseries develop their plants in a dirt less, peat-or bark-based developing blend. The supplements then, at that point, are applied to the developing blend through the water supply.

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