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AUTOMATING AND ANALYZING GREEEN HOUSE HYDROPONIC FARM USING IOT

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Abstract: Hydroponics is a method of growing plants without soil. It is the fastest growing sector of agriculture and it could very well dominate food production in the future. This project is used to make a compact system to automate nutrient dose, pH, water supply and temperature of a greenhouse hydroponic farm. To gain information about the farm by plotting graphs using sensor data. This project is used to analyze and monitor the farm temperature, moisture and maintaining pH value in the water. We using IOT based hydroponic farms for food production, so we can control the farm temperature, moisture and nutrients in anywhere. All information about the farm is saved in cloud storage. A standard website made which will take sensor data place correct graphs and help farmers to attain information. This website is used to automate water supply, maintain pH value and temperature of the hydroponic farm and also sending messages automatically to farmers or owners through mail, whatsapp or normal messages. The scope of our project is too many IOT enabled hydroponic farms can be placed near the city areas which will directly cut the transportation cost. Sensors like pH sensor, LM35 temperature sensor, LDR, Arduino Microcontroller, ESP8266, Relays and DC motor.

Keywords: Hydroponics, IOT, Sensors, Nutrients, Cloud, Website.

I. INTRODUCTION

Now a day's soil based agriculture is now facing various challenges such as natural disaster, urbanization, climate challenge, scarcity of water resources, and indiscriminate use of chemicals and pesticides which is depleting the soil fertility. So, the farmers looking for modern technique in farming. The farmers also require very less water consumption, reduce the usage of pesticides, controlled environment and high yielding plant in farming. Usually the greenhouse farming is a framed or inflated structure covered with a transparent or translucent material to growth the plant in controlled climatic conditions. We using the greenhouse hydroponic farm is a subset of hydroculture, which is a method of growing plants without soil, by instead

using mineral nutrient solutions in a water solvent. We grow the plants in bottles and containers. To enable the IOT technique in hydroponic farm would help the farmers to automate and control the whole farming process thereby ensuring better yielding and quality of the product.

In hydroponic farm uses 20 times less water than soil based farming and use 20% less space for growing. It does not need soil for growth. The IOT enabled hydroponic farms is automatically control the farm process and monitor the water level, nutrients and environment temperature. Hydroponic farms can be locate in anywhere and anyplace even in the room. We growth the plant in water instead of soil so add the nutrients in the water for correct level and maintaining the nutrients using IOT. All plants are not growing in same temperature, different plants require different temperature for grow. We also control the surrounding temperature in hydroponic farm. All the information about the farm such as water level, nutrients, pH level, and temperature are stored in the cloud. The farm information's are automatically send to the farmers through message. So, the farmers can control and monitor the farm process in anywhere.

II. LITERATURE REVIEW

The first hydroponic farm is shown from the famous hanging gardens of Babylon in around 600 B.C. Other records of hydroponics in the ancient times were found with the floating farms around the island city of Tenochtitlan by the Aztecs in Mexico in the 10th and 11th century. And in the 13th century, the explorer, Marco Polo noted in his writing that he saw similar floating gardens during his travelling to China. In 1699 John Woodward founds that plants grew best in water instead of soil. The water contains plant growing nutrients. In the early 1930s W.F.Gericke of the University of California at Berkeley experimented with nutriculture for the production of agriculture crops. W.A. Setchell recommended the term "hydroponics" to Gericke in 1937, so the name goes. Gericke Successfully growing 25-foot tall tomato plants in nutrient filled solutions. In 1940s hydroponic was used in the Wake Island, a soilless island in the Pacific Ocean. In the 1950s, the soilless method of

Hydroponics expanded to a variety of countries including England, France, Italy, Spain, Sweden, the USSR, and Israel. Recently in New Jersey in the USA, the largest hydroponic farm is being built. They are to bring 2 million pounds of fresh, leafy lettuce per year. In the space science industry, NASA has considered the hydroponic growing method for feeding and nourishment to astronauts on the space station and on mars. There are going to be big challenges for agriculture sectors in the future when food production is predicted to increase by 70% according to the FAO in 2050.

III. IMPLEMENTATION

This project is based on the IOT enabled automating and analyzing greenhouse hydroponic farm. In our project the

parameters are controlled automatically. Also, the farmers can know the condition of the farm and control the parameters remotely by using IOT. We creating the website it give the information about the farm to farmers and show the data in graph format. By using this format the farmers can easily understand the information and also the data's are sending to cultivators in text messages or mail.

System modules:

- water sensor
- LM35 Temperature sensor pH sensor
- LDR
- Relays ESP8266
- DC Motor
- Arduino Microcontroller

1. **Water sensor**

A water sensor is a device used in the detection of water level in the various applications. It detects the presence of water level in the container.

2. LM35 Temperature sensor

The temperature sensor is used to measure the temperature of the environment. LM35 is an integrated analog temperature sensor whose electrical output is proportional to the Degree Centigrade. It measures the amount of heat energy or even coldness is generated by an object or system.

3. **pH sensor**

The pH sensor is used to measure the amount of alkalinity and acidity in water and other solutions. It measures the amount of nutrient contents present in the water.

4. LDR

An LDR (Light Dependent Resistor) is a component that has a (variable) resistance that changes with the light intensity that falls upon it. This allows them to be used in light sensing circuits. When a LDR is kept in the dark place, its resistance is high and, when the LDR is kept in the light its resistance will decrease.

5. Relays

Relays are switches which are operated both electromechanically and electronically.

Relays control one electrical circuit by opening and closing contacts in another circuit. A relay is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. Relays are used to control high voltage circuits

with the help of low voltage signals. Similarly they are used to control high current circuits with the help of low current signals.

6. ESP8266

The ESP8266 Wi-Fi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. It is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. It can be controlled from your local Wi-Fi network or from the internet.

7. DC Motor

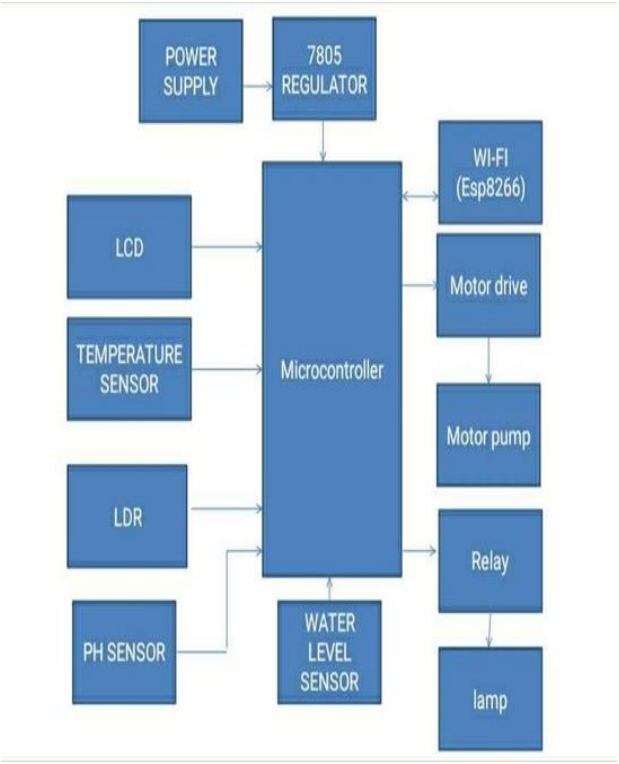
Electric motors turn electricity into motion by exploiting electromagnetic induction. The motor features a permanent horseshoe magnet and a turning coil of wire called an armature (or rotor, because it rotates). It consists of a stator, an armature, a rotor and a commutator with brushes. Opposite polarity between the two magnetic fields inside the motor cause it to turn. DC motors are the simplest type of motor and are used in household appliances, such as electric razors, and in electric windows in cars.

8. Arduino Microcontroller

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. It is a single board microcontroller meant to make the application more accessible which are interactive objects and its surroundings.

All the above mentioned sensors are connected together with the Arduino UNO. Then based on the Embedded C programming the Greenhouse Hydroponic Farm is worked.

Block Diagram:

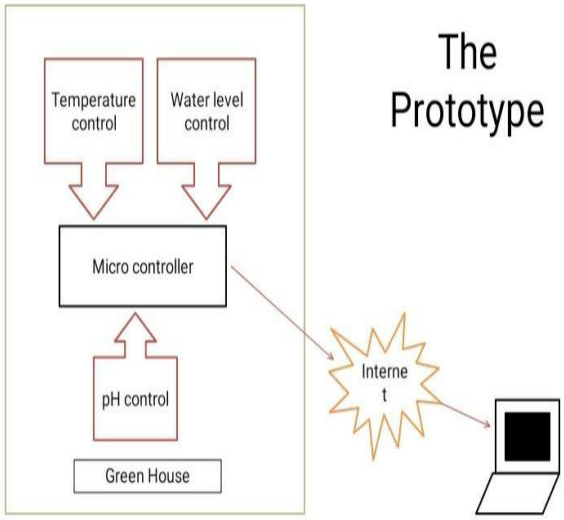


Website Function:

In this project we using the website to control and monitor the hydroponic farm. The above mentioned device is connected to the website. This website is cloud based, so the data's are stored in cloud, we can access and control the farm anywhere. It automate water supply to the farm and monitor the pH value and temperature. If the water level is low it send the warning message to the farmers and automatically or manually switch on the motor pump to flow the water in to the plant. After filling the required water it automatically switch off the motor. Temperature when exhaust fan is on vs. when it is off. All these information's are

shown by graph. We can customize the website for our convenient (The format of graph, table or pie chart). It makes graph

such as CO2 levels in the system vs. CO2 levels out of the system. It also accounting the farm data.



Advantages:

Make better use of space and location. Effective use of nutrients.

pH control of the solution Better growth rate

Fewer pests& diseases No soil needed.

Labor and time saver

No soil borne diseases, no weed, no dust.

Production is high

Disadvantages:

Initial cost is high. Needs more supervision.

Experiences and technical knowledge System failure threats

IV. CONCLUSION

In this paper, we introduced a device for automate and analyze the greenhouse hydroponic farm. By using this device and website the farmers can control and monitor the farm anywhere. Anyone can make IOT enabled hydroponic farm in our home and city areas with high production. In future the government, big corporations will jump into hydroponics because of low arable land, availability of water, costs, climate change, increasing population.

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