International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878 (Online), Volume-8 Issue-6, March 2020

Development and Monitoring of Hydroponics using IoT

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Abstract: ***In India, many People doing the agriculture, and it is a backbone of our country, in agriculture there are many problems like small land holdings, manures, pesticides, chemicals used by farmer for agriculture etc. Customers also increasingly demanding for the healthy FOOD diet which is good in quality and free from agricultural chemicals and pesticides. Our proposed system is fulfilling the above requirements and we are growing the plants organically. It is possible to controlled environment, in any place like room terrace, balcony etc. Also, we are growing large number of plants in small area. This is one of the type of agriculture can be more productive if monitored and controlled efficiently. In this system, we are controlling the all necessary things which need to the plants using IoT. People living in crowded city streets, without gardens, it they can grow fresh vegetables. It also useful for home growers as well as commercial growers.***

Key words: NodeMCU (ESP8266), DHT11 Sensors, pH Sensor.

I. INTRODUCTION

Hydroponics is a farming system that uses nutritious water instead of soil for plant nutrition. In our day-to-day life Hydroponic plants become an integral part of life as technology advances and improve people's living standards. Not only do hydroponic plants decorate the environment, they also make you happy. However, the plants are mainly growing in soil. It is known that a there is a series of deficiencies can be found in such routes. For example, regular watering and fertilizing require more time and labor. In our India there is development of various techniques; soilless planting plant has become a more popular, such as hydroponic. Hydroponic is eco-friendly system to growing the crop without soil by utilizing aquaculture and hydroponics. Currently hydroponics system is used in agricultural sector also. Modern people are always engaged with their work and they have less time for doing and keeping maintenance of hydroponic plants giving watering and fertilization frequently.

Manuscript received on February 10, 2020.
Revised Manuscript received on February 20, 2020.
Manuscript published on March 30, 2020.
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In our future life there is trend of smart lifestyle is becoming popular with the help of development of sensors, internet, and communication and computer technology. To solve the current deficiency, this system is designed for monitoring and controlling system
which can easy to monitoring and controlling system. The system can sense the hydroponic device's environment in a real-time it gives the stable way and also transmit the real time data which is temperature, humidity, light intensity, pH level. The hydroponics word formed by Greek “hydros”, which means water and "ponos", which means workSometimes, they may be mistaken for fishing, but these terms are widely used in other areas of science that have nothing to do with gardening. As our increasing in population and lands are available for the producing the crops, Hydroponics gives us lifeline and giving crop production in greenhouses or multi-tiered buildings for agriculture. Already, where land costs are high, there crops are grown using hydroponic system in groundwater, rooftops and greenhouses Perhaps you would like to start a garden for grow your own vegetables, but you have no space in your garden or you are lots of pests. This article will helps you the building of successfully setting up a hydroponic garden in your home and providing tips for growing plants easily without a big investment. Hydroponics is a type of agriculture where plants are grown without use of soil. Plants are usually dissolved in water instead of nutrients taken from the soil only, and roots of plants are flooded, suspended or improperly used with nutrient solution, depending on the type of hydroponic system used so that the plant can get the ingredients. It is essential for growth. Objectives: - 1) Development of Hydroponics to monitor air temperature, root temperature, humidity, pH, etc. 3) to control above parameters uses IoT.

II. LITERATURE REVIEW

This section discusses discoveries and discoveries related to this area of the system. The discussion begins with the development of surveillance systems, monitoring systems and wireless communications, as well as data entry and order submission. All relevant research papers and journals providing ideas and ideas in this project have also been explained in simple words [2].Cucumber is probably the first cereal crop to grow in the first century under the "For the Roman Emperor Tiberius”. Technology has rarely been used in the last 100 years. An English scientist named John Woodward was born in the 17th century. 1 In 1699 in England, hydroponics was used to grow mint plants without soil. During the 1600’s various methods were used to protect the horticultural crops from the cold.

There are glass lanterns; bell rugs, cold frames and hot bed covered with glass are used. In the thirteenth century, to warm for the plants they used portable wooden boxes covered with oil translucent paper.

In the same century, England and France heated their greenhouses using the manure and covered with the help of glass. The first glass house, built in the 1700's, was used as a sloping roof only on one side. During the century glass are used to cover both sides. Glasshouse is used very rarely for fruit crops like melons, grapes, peaches and strawberries, and only for production vegetable. Developers of this new technology, taking into account market profits, took the crops that appealed to the rich and privileged, the people who could afford the luxury of freshly harvested fruit in the greenhouse [3].

III. SYSTEM DESCRIPTION

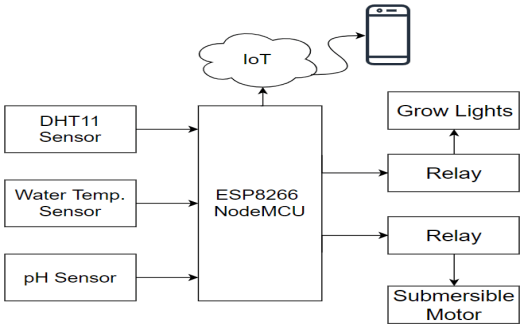

Fig. 1: Block diagram of System

Working of Project:

Above Fig. shows the block diagram of Development and monitoring of hydroponic system using IoT. In this system we are monitoring and controlling the environment around the plants. All the sensors are interfaced to the ESP8266; it is used to all the sensors are working in synchronously. The DHT11 is used for sensing the temperature and humidity from surrounding environment, while pH sensor is used for the sensing the pH level of nutrients and also shows the electrical conductivity of nutrients. In this system there is sprinklers are used to control the humidity and temperature around the plants. Sprinklers are used for sprinkling the pH solution/water in response to the humidity. The submersible motor is used to fill the pH tank of plants. The pH value of nutrient solution should be between 5-6.5 so that the plant will not affected. LED Grow lights are used to produce lights (red and blue) its helps to grow the plants as fast as possible with compared with soil plants. In addition, pest detection on plants and sprinklers will be used to sprinkle organic pesticides. The all output data is interfaced with ESP8266 Wi-Fi module so that's all the data is continuously monitored on Blink app and also data stored on cloud.

IV. PROBLEM STATEMENT

There are many areas in the world where the soil doesn't have enough nutrients to grow the plants so Hydroponics is a technique of growing plants where soil is not used. Plants are usually dissolved in water instead of just nutrients taken from the soil, and the roots of the plant are suspended, flooded, or improperly treated with nutrient solution, depending on the type of hydroponic system used so that the plant can get the ingredients. It is essential for growth.

V. COMPONENTS DESCRIPTION

A. ESP8266 NodeMCU:

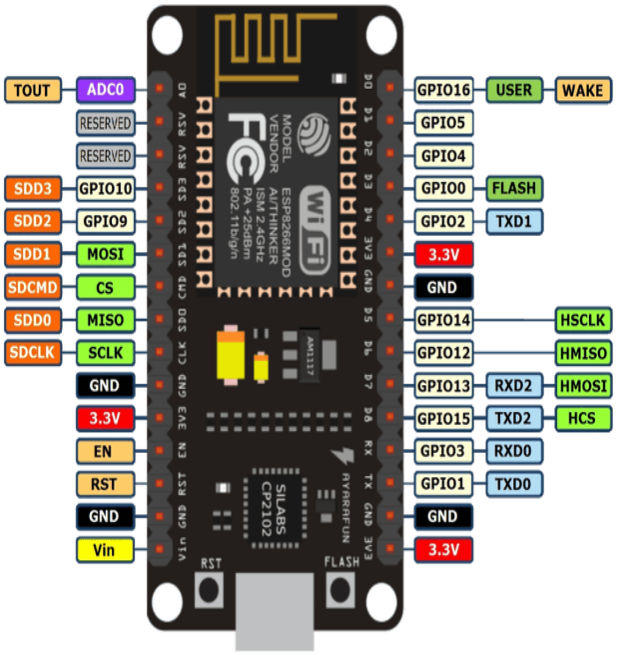

Fig. 2: NodeMCU

Features of ESP8266 NODE MCU

- 802.11 b/g/n protocol
- Wi-Fi Direct (P2P), soft-AP
- Integrated TCP/IP protocol stack Integrated TR switch, LNA, power amplifier and matching network
- Integrated PLL, regulators, and power management unit
- +19.5dBm output power in 802.11b mode
- Integrated temperature sensor
- Supports antenna diversity
- Power down leakage current of ¡ 10uA
- Integrated low power 32-bit CPU could be used as application processor
- SDIO 2.0, SPI, UART
- STBC, 11 MIMO, 21 MIMO
- A-MPDU A-MSDU aggregation 0.4s guard interval
- Wake up and transmit packets in ¡ 2ms
- Standby power consumption of 1.0mW (DTIM3)

B. DHT11:

Specifications of DHT11

- Operating Voltage: 3.5V to 5.5V.
- Operating current: 0.3mA (measuring) 60uA (standby)
- Output: Serial data.

- Range: 0C to 50C.
- Humidity Range in percentage: 20 to 90
- Resolution: Temperature and Humidity both are 16-bit.

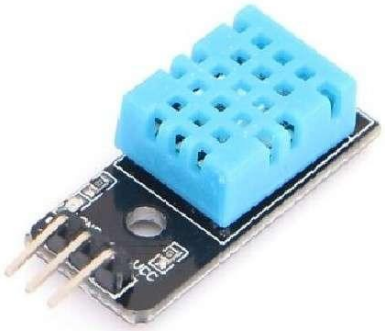

Fig. 3: DHT11

C. pH Sensor

The pH, is used for the water quality measurements purpose, it is used for a checking given solution is acidic or alkaline. It is generally pH scale ranging from 0-14. The neutral value of pH is 7. The increase in volume increases with alkalinity, while the increase in volume decreases with acidity. Each ingredient can only be updated ten times, and acidity or authenticity can be updated. PH value and the negative logarithm of the hydrogen ion concentration or activity of hydrogen-ions. The pH electrode is deep inside the tank filled with a solution whose pH needs to be measured. The glass bulb at the end of pH electrode which contains the lithium ions, which act like selective barrier. Where hydrogen ions are associated with the concentration of hydrogen ions, the potential for the development of the potential, through the drying of the glass and through the opposite, is unknown.

Fig. 4: pH Sensor

VI. ADVANTAGES

1) Higher yield achieved in a smaller space.
2) Soil-borne pests and diseases are eliminated.
3) This hydroponic system is a water saving system. It will be used effectively in future because of issue of water in feature
3) This hydroponic system can be embedded in small area like bedroom and terrace etc. the root of plants are grow and spread in search of food and oxygen. In this system the plant is kept in tank which contains lots of nutrients. This means plant grow faster than soil plants.

VII. RESULTS

Figure 5: Iot Based Hydroponic System set up

GROWTH OF PLANTS

Plants need light, air, water, food for a perfect growth. All these factors we can provide in hydroponic system. Figures 6.1, 6.2 and 6.3 shows the results of growing of the plants day wise. We can observe that plants growing in less amount of water. The rate of growing plant in hydroponic system is greater than the soil.

Figure 6.1 Growth of plant: Day 2

Figure 6.2 Growth of plant: Day 8

Figure 6.3 Growth of plant: Day 15

IoT or Internet of things can be interpreted as a system of inter-networking computing devices, mechanical or digital machines or objects that with unique indenters can transfer data over a network without the need for a human interaction. For the agricultural industry specially, we feel Internet of Things has unleashed ancient ways to regulate and maintain soil composition, water and crop health with the use of economic sensors. Prospering on this concept, smart farming applications are being devised that promise to deliver constant and live-time analysis of soil and crop health, machinery, storage condition and resource consumption level.

The android application with the data display

Table1. Summary of result data

pH Value	Temperature	Humidity	Water Temp.	Status
6.25	30.2	70.8	28.5	Humidity high
6.22	25.5	35.5	28.56	Temperature low
6.00	30.5	36.0	29	All Good
6.20	30.42	36.25	39.2	Water temp. high
7.02	29.5	34.5	30.5	pH value high
5.80	31.22	34.25	29	All Good

The above Table 1 shows the results of sensor on mobile. There is continuously data is sending on mobile. with the help of this we are controlling the environment around the plants if there is any change in the parameter as shown in the table, we will control that one and it comes at desired level. Every plant has different parameter for environment control.

VIII. CONCLUSION

By using IoT based Hydroponic system, nutrients are provided to the plants through less water, for Figure of monitoring system nourishment. All the sensor parameter are continuously monitored on mobile for better environment control. We can observe that, plant grows well by using this system without use of soil. The rate of growing plant in hydroponic system is greater than the soil.

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