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# IoT Based Hydroponic Farming

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**ABSTRACT:** High yielding and high grade of crops are essential in modern day agriculture, this can only be achieved by smart farming technology which is used for making farms more intelligent in sensing its controlling parameters. Manual monitoring is in practice which is a very trivial task because the plants may die out if there is no proper care is taken. The architecture of this hydroponic system which is fully automatic that can be integrated into the agricultural curriculum while introducing business skills. The automatic monitoring and control of the environmental events such as light intensity, pH, electrical conductivity, water temperature, and relative humidity is carried out by lodging sensors and actuators onto the system. The maintenance and automated monitoring are done by the intervention of the IoT that are used to transfer and retrieve data to the internet (mass storage) and a mobile app is used to communicate the current status of the hydroponic system to the user through the use of internet to their mobile phones. This futuristic system can use high data analytics and prolonged data gathering to improve the accuracy of reckoning.

**KEYWORDS:** IoT; Wi-Fi/GSM; Temperature Detection; Cloud Interface; Smart Phone App; Sensors;

## I. INTRODUCTION

Hydroponic is a method where the crops are grown in the absence of soil the nutrients that are acquired from the soil are given to them artificially. The term Hydroponics was acquired from the Greek words 'hydro' means water and 'ponos' means labour. This soil less culture of originating crops often involves their roots to be immersed in the nutrient solution along with some gravels or perlite medium. The maximum yield is achieved by the supply of sufficient quantity of nutrients and optimum microclimatic conditions are the main goal of hydroponics. Since soil is excluded from production process there will not be any problem related to soil borne diseases, pests and weeds. By the exclusion of these problems, there will not be any usage of harmful plant protection chemicals, so that there is a fresh and healthy yield of crops by the hydroponic method. The set-up of hydroponic only

Demands limited space and limited quantity of water as they recirculate and reuse the water. This eliminates the problems that are caused by soil. This limited space requirement also favours hydroponic as it can be accommodated in terraces, balconies and courtyards. So, there is a high probability of growing crops in urban areas, where cultivable land is limited. Hydroponics does not cause any adverse effect on the quality of fruits and flowers produced by it

Hydroponics is an agricultural method of producing plants in an artificial environment without using soil – nutrients which are provided through water – and by optimizing the growing conditions to improve the production. Hydroponically cultivated plants have a growth rate that is much faster and highly yielding than that of plants grown in soil. Because they are cultivated in containers, pest and disease control is at an optimum.

In natural conditions, soil itself acts as a mineral nutrient reservoir but it is not essential for plant growth. The roots can easily absorb the mineral nutrients in the soil if it is dissolved in water. If the minerals are present in the supply of plant's water artificially, then the plant no longer requires soil to thrive. We can grow any terrestrial plant by this method. The method for growing plants by using mineral nutrient solutions, in water, without planting in soil is known as hydroponics. For simplifying and automating many complex real-world tasks the information and communication technology methods are used. The internet plays a major role in implementing information and communication technology sectors. Communications in the internet mainly involve client server connections. The information and communication technology moves to the next stage on creating and sharing information where the humans rely on machines such as weather monitoring system, etc. At this time the machine-to-machine (M2M) communication is also in a peak where one machine receives the information of other machines. In future, everything around us could be connected and they are able to sense and cooperatively communicate over the Internet, thereby giving birth to the Internet of Things (IoT). The basic idea behind IoT is the pervasive and ubiquitous presence of the things or objects around us like mobiles, sensors, radiofrequency identification (RFID) tags, etc. This leads to the Generation of huge amount of data that need to be stored, processed, and presented in an energy efficient manner.

## **II. LITERATURE REVIEW AND OBJECTIVE**

### **LITERATURE REVIEW**

Dr. D.K. Sreekantha et.al [1] analysed that the Internet of things (IOT) is remodelling the agriculture enabling the farmers with the wide range of techniques such as precision and sustainable agriculture to face challenges in the field. IOT technique helps in collecting information about conditions like weather, moisture, temperature and fertility of soil, Crop online monitoring. It enables the detection of weeds, level of water, pest detection, and animal intrusion in to the field, crop growth, and agriculture. IOT leverages farmers can get connected to this farm from anywhere and anytime. Wireless sensor

networks are used to monitor the farming conditions and micro controllers are used to control and automate the farming processes. To view the conditions remotely in the form of image and video, wireless cameras have been used. A smart phone empowers the farmer to keep updated with on-going conditions of his agricultural land using internet at any time and any anywhere. IOT technology can reduce the cost and enhance the productivity of traditional farming. In this paper they proposed an application prototype for precision farming using a wireless sensor network with an IOT cloud.

Foughali Karim et.al [2] reviews that, as water supplies become scarce because of climatically change, there is an urgent need to irrigate more efficiently in order to optimize water use. In this context, farmers' use of a

Decision-support system is unavoidable. Indeed, the real- time supervision of microclimatic conditions is the only way to know the water needs of a culture. Wireless sensor networks are play an important role with the advent of the IoT and the generalization of the use of web in the community of the farmers. It will be judicious to make supervision possible via web services. The IoT cloud represents platforms that allow to create web services suitable for the hardware integrated on the Internet. In this paper they proposed an application prototype for precision farming using a wireless sensor network with an IoT cloud.

Jumras Pitakphongmetha et.al [3] analysed that, the effects of the global warming, and the plants are affected with UV rays. For this reason more difficult to planting in uncontrolled environment. On the other hand, the yield does not match customers' needs. For these reasons, planting in a greenhouse is easy to maintain and to control important factors such as light, temperature, and humidity. Using of sensors in a greenhouse as Wireless Sensor Networks System are the efficiency of technology used in agricultural development by sending data to the cloud and controlling values such as temperature, light, etc. THE results of his study will be useful for the farmer and related organizations applying in the farm.

Srisruthi.S et.al[4], analysed that Agriculture requires the dedication of many natural resources, including land, water, and energy. So, they adopted

sustainable agriculture which supports careful management and cultivation of crops involving less use of fertilizer, pesticides, calculated use of precious natural resources like energy, water through controlled irrigation and fertigation practices with the help of green sensor technology and electronic control systems. In this paper, they proposed an efficient automated farm monitoring and irrigation techniques which incorporate wide range

of sensors to remotely sense and monitor various parameters of the soil like temperature, moisture, fertility and regulate the supply of water and fertilizer to the land based on the requirement. An algorithm formulated with

the threshold values of sensor outputs is used to code the microcontroller which performs the required actions by employing relays until the strayed-out parameter has been brought back to its optimum level.

The cloud based

user friendly interface facilitates real-time data logging of the environmental parameters while also supporting analysis of past statistics for future growth by means of a web-based customizable application.

Furthermore, the

project aims to optimize the use of land and labour, conserve water, increase crop yield, avoid wastage of energy and provide maximum automation and benefit the society by adopting smart environment friendly technology to implement newer and sustainable ways of agriculture.

Tsung-Han Wu [5], developed an Intelligent Plant Care Hydroponic Box, from the experimental measurement results of IPCH-Box, the developed

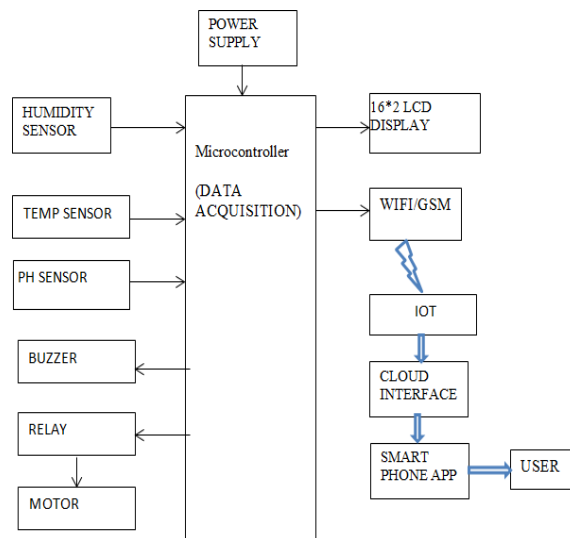
environment driven control methods include light, water sprinkler and water pump which can effectively lower the CO<sub>2</sub> concentration, the temperature and increase water level, respectively. Specifically, the time of CO<sub>2</sub> Concentration reduction in IPCH-Box is 38.53% faster than the plant system without our mechanism. Sensor technology has been intensively applied to plant care system. There exist two kinds of plant care systems. A large-scale plant care system can be a plant factory or a green houses. On the other hand, a small-scale plant care system with the size of several square feet is typically installed in a green laboratory. Generally, a small-scale plant care system can be transformed from a large-scale system.

Chanya Peuchpanngarm et.al [6], developed a DIY sensor-based automatic mobile application for hydroponics. The application enables automatic Environmental control for hydroponics via different types of sensors including water, temperature sensor, humidity and humidity sensor, and light intensity sensor. It also consists of the functions for planning, Monitoring, as well as harvest data recording, of hydroponic gardening to fulfil the planting demands. The harvests data will be used for hydroponics planning in the next grow. In addition, users can monitor the plant Growing progress remotely.

### OBJECTIVES

1. To recognize IoT use in the agricultural sector.
2. To learn how the conventional hydroponic system can be strengthened.
3. To consider India's smart agriculture reach and potential.
4. To evaluate conventional practices in order to support our farmers by means of modern smart farming methods.

### III. METHODS AND BLOCK DIAGRAMS



**Figure 1: Block Diagram**

The IoT plays a major role in the automation process. Automating this hydroponic system is the most crucial part; this can be easily achieved by integrating the hydroponic system with the IoT. Cloud database acts as the hub for the whole automation process; this database contains all the information on the hydroponic system that is it has the information on the data that has been retrieved from the crops and the water tank. Sensors and actuators are used in order to automate the hydroponic system, these sensor values are sent to the cloud database from which the user is updated with the real time information about crops condition. The user can also adjust the configuration of the sensors and actuators from the developed mobile application. The mobile application has all the specification about the hydroponic system; the user must have a unique login ID. The user name and the password are registered with the cloud database; by this the user can operate with his crop field without any interruptions. Through this mobile application the user can select which seed are to be planted in the crop bed, the water flow can also be controlled with the help of this



mobile application. The user can control the flow of water from one tank to other tank with water level sensors and solenoids.

#### **IV. REQUIREMENT ANALYSIS**

Hardware resthisce required

5. LCD Display (16\*2)
6. PIC 18f4520
7. SIM800A Quad Band GSM/GPRS Serial
8. Humidity Sensor
9. Temperature Sensor (LM35)
10. PH Sensor
11. Buzzer
12. Relay
13. Power Supply
  - Transformer
  - Diode 1N4007
  - Filter Capacitor
  - Three pin voltage regulator
  - Additional filter capacitor
  - Decoupling capacitor
  - LED for indication

Software resthisce required

7. Operating System: mplab ide 8.00
8. Programming: C Language
9. Compiler: CCS Compiler

#### **V. RESULTS AND DISCUSSION**

Production of terrestrial crops by the usage of hydroponic system is beneficial in proper resource management and can yield much larger amount of healthy crops than traditional farming. Integration of this type of farming with internet and IOT opens up multiple opportunities to study the benefits of this system in many different regions of earth which further helps in improving the process of the system. The features of news feed or links to buy hydroponic system and its components helps to add another factor for a full, IOT backed system, for the user. Community building with the help of IOT web server can help to spread the awareness of hydroponics and also a platform for people to get connected and to share ideas and thoughts.

#### **REFERENCES**

1. Bhagayshree Jadhav and S.C. Patil, "Wireless Home monitoring using Social Internet of Things (SIoT)", IEEE International Conference on Automatic Control and Dynamic Optimization Techniques (ICACDOT), 9-10 Sept. 2016.
2. D. Saraswathi, P. Manibharathy, R. Gokulnath, E. Suresh Kumar and K. Karthikeyan, "Automation of Hydroponics Green House Farming using IOT", 2018 IEEE international conference on system, computation, automation and networking (ICSCAN), 6-7 July 2018.
3. Ehsan Tavakkoli, Pichu Rengasamy and Glenn K. McDonald, "The response of bar-ley to salinity stress differs between hydroponic and soil systems", Functional Plant Biology, Vol. 37, pp. 621 - 633, 2010.
4. Hanna Norn, Per Svensson and Bertil Andersson, "A convenient and versatile hydroponic cultivation system for Arabidopsis thaliana", Physiologia Plantarum, Volume 121, Issue 3, July 2004.
5. De Zeeuw H and Drechsel, Cities and Agriculture: Developing Resilient Urban Food Systems, Routledge, London, UK, 2015.
6. Resh, H. M. Hydroponic Food Production: A Definitive Guide of Soilless Food-Growing Methods; Woodbridge Press Publisher, USA, 2001



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