

Dosing System for Hydroponics

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ABSTRACT

Hydroponics is one of the farming techniques, for growing plant in a nutrient medium. Though several machine-controlled systems were developed in past few decades, there have been no totally machine-controlled system that manages and monitor the growth of crops with the help of IoT. Our project emphasizes on an automatic system with the assistance of microcontrollers that help us control and manage the cultivation of crops. The ultimate goal of this project was to develop associate IoT primary based management system that might additionally expeditiously maintain target concentrations of individual nutrients needed for plant growth with the help of sturdy nutrient dosing algorithmic rule and also the use of embedded chip technology. The basic aim behind our project was to create a system made up of a micro-controller and an array of multiple sensors and pumps that will mechanically control the nutrient refilling events by getting nutrient status in real time over the internet with the help of IoT based Dosing system. Dosing system thus helps us manage nutrients required by crops, economically and thus help achieve higher yields.

Keywords: Hydroponic, EC, micro-controller, IoT, Ultrasonic Sensor, Pump, etc

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I. INTRODUCTION

Hydroponics is one of the farming techniques, for growing plant in a nutrient medium. There are many types available in this type of farming, but the most used system is the drip system. In hydroponic farming, there is no messy soil involved and thus it doesn't require any weeding. In this system as no soil is required, we can grow crops not only horizontally, but vertically also. This helps us save space and thus increase quantity of plants to be grown in same area. With the help of an IoT based dosing system for providing nutrients regularly as and when required, we can grow crops anywhere and at any time of year. It uses up to 90% of less water as compared to traditional method. It can also be used by working people or by people who lack gardening skills. Hence, it is helpful for everyone. With the help of an IoT based framework, it will collect real-time data with the help of sensors about the nutrient level left in the containers. This information is then passed on via the internet to the user and thus he can manage the nutrient

concentration required, by simply giving commands via a user-friendly app. Its simplicity thus inspires people to grow plants and thus help make earth greener.

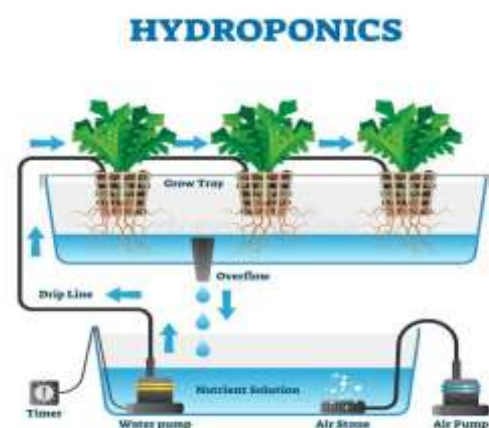


Fig 1: Overview of hydroponic system

Problem statement:

Developed system consists of a micro-controller that has nutrient controller and an array of multiple sensors and pumps that will mechanically do the replenishing of nutrients required by crops based on real-time measurement of nutrients. In traditional method nutrients were supplied physically. Thus, to remove this process of supplying nutrients physically, IoT based dosing system was developed.

II. LITRATURE SURVEY

[1] W. J. Cho, H. J. Kim, D. H. Jung, associate degree EMBEDDED SYSTEM FOR machine-controlled farming NUTRIENT resolution MANAGEMENT (2017), during this paper overcome the matter of decoupled renewal among the 3 nutrients found within the previous study, a strong plant food dosing formula was designed which will one by one calculate the volumes of six nutrient stock solutions to be equipped in an exceedingly serial order in keeping with specific ions.

[2] Rakesh Gunnam, N. Thejaswini, watching and automatic farming system mistreatment sensible emu (2020), This paper discusses on how to collect the periodic time knowledge from sensors like congregation of nutrients, pH of nutrient solution, warmness of water, intensity of sunshine, water and nutrient solution volume left in tank with the help of supersonic sensor.

[3] Riko Tandil, Johan Yapson, farming nutrient mixture system supported STM32 (2018), This method is controlled by micro-controller with the help of pumps. The output of the blending method, is solution A and B mixed to form a mixed solution in specific concentration.

[4] Rekha P, Maneesha V. Ramesh, High Yield Groundnut Agronomy:An IoT Based Precision Farming Framework (2017), This paper discusses the development of an IoT framework that helps farmers to improvise their ways of farming and conjointly create the simplest use of their land for a far better yield and financial gain.

[5] Prashaunsa J. Nachankar, IOT in Agriculture (Apr-2018), this paper discusses about the collection and processing of data. During the project, we used sensors to measure numerous parameters like temperature, humidity, moisture content, etc. This data is collected and reserved onto a server.

III. BLOCK DIAGRAM

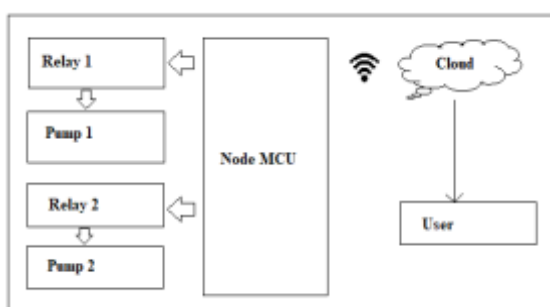


Fig 2. Block Diagram

DESCRIPTION:

Hydroponic is a methodology that can be used to grow crops in areas where there are no nutrients in the soil or where the land is barren, by supplying nutrients to crops artificially. Growing of crops without soil usually means that we have to submerge the roots of plants in a nutrient solution by taking help of pebbles, or by using an inert, porous and lightweight substance to be used as substrate. Also, we don't have to worry about pests and weeds or any soil related diseases. The arrangement for cultivation region, needs very little area and limited water supply as it can be circulated again and used again, so that there is no water wastage. As very less area is required, hydroponic gardens can be grown in terraces, balconies and courtyards. This helps us grow plants in urban areas, where available land for growing plants is very limited. Hydroponic farming doesn't cause any adverse impact on the standard of fruits and flowers made by it.



Fig 3: Dosing system overview

Dosing system helps ensure that the correct volume of water and nutrients is provide, so as to use water and fertilizers with great efficiency. This can be termed as dosing system. Usually, in most farming systems, the availability of water and nutrients is performed with a relentless irrigation frequency, to guarantee that every irrigation cycle delivers the quantity of nutrient solution required for the plants. This sort of irrigation management could result in suboptimal conditions in several periods of time. The planned dosing management is a lot more rational than the presently used management methodology, because it takes under consideration of nutrients required and thus help avoid use of fertilizers and water in excess. Hydroponic is one of many farming methods, where in instead of growing plant in soil like in traditional methods, it is cultivated without soil in a nutrient solution. The ultimate goal of our IoT based project was to develop associate IoT primary based management system that might additionally expeditiously maintain target concentrations of individual nutrients needed for plant growth, with the help of sturdy nutrient dosing algorithmic rule and also the use of embedded chip technology. We developed an embedded system consisting of a micro-controller and an array of multiple sensors and pumps that will mechanically control the nutrient refilling events by getting nutrient status in real time over the internet with the help of IoT based framework.

IV. CIRCUIT DIAGRAM

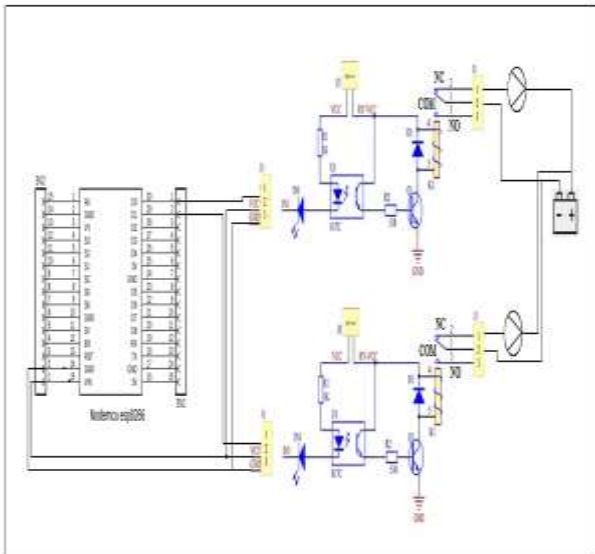


Fig 4. Circuit Diagram

V. PROJECT HARDWARE AND APP IMAGE



Fig 5: Dosing system in action



Fig 6: App design

VI. RESULT



Fig 7: Initial Stage



Fig 8. After Some days

VII.CONCLUSION

In this study, a Dosing system for hydroponic farming, which manages nutrient concentration was developed with a user friendly interface. The dosing system was able to support and measure concentrations of individual solvents to create a balanced solution of nutrients which can be delivered to crops. This study has shown that there exists a massive potential in farming systems to preserve water and nutrients required by crops, by shifting the dosing management from a changeable dose, to a dose calculated according to the quantity of used substrate in the bag, the characteristics of the substrate and the salt concentration of used water. This system takes into consideration the water holding capability as compared to traditional methods. As a

results of an improved dosing management system and procedure, fertilizers and water will be preserved while maintaining good health of the plants and thus help achieve higher yields.

REFERENCES

- [1] W. J. Cho, H. J. Kim, "AN EMBEDDED SYSTEM FOR AUTOMATED HYDROPONIC NUTRIENT SOLUTION MANAGEMENT", Vol. 60(4): 1083-1096 © 2017 American Society of Agricultural and Biological Engineers ISSN 2151-0032 <https://doi.org/10.13031/trans.12163>
- [2] Rakesh Gunnam, N. Thejaswini, "Monitoring and Automated Hydroponic system using smart power unit", International Journal of Control and Automation Vol. 13, No. 4, (2020), pp. 47 – 54
- [3] Riko Tandil, Johan Yapson, "Hydroponic nutrient mixing system based on STM32", ICEED-2018 iop publishing doi:10.1088/1755-1315/195/1/012052
- [4] Rekha P, Maneesha V. Ramesh. "High Yield Groundnut Agronomy: An IoT Based Precision Farming Framework", 978-1-5090-6046-7/17/\$31.00 ©2017 IEEE
- [5] Prashaunsa J. Nachankar¹, Mayur G. Somani², "IOT in Agriculture", e-ISSN: 2395-0056 Volume: 05 Issue: 04 | Apr-2018 www.irjet.net p-ISSN: 2395-0072