Automated Hydroponic System using Psoc4 Prototyping Kit to Deliver Nutrients Solution Directly to Roots of Plants on Time Basis

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ABSTRACT: Hydroponics is method of growing plants using mineral Nutrients solutions in Water without soil. Hydroponics not only save water but also save land. This paper represents Automated Hydroponic systems that automatically deliver nutrients solution into water in every week for tomato plants. The mix of Water and nutrient solution is continuously recirculate throw the water pump. Automated hydroponic system supply water and mix of nutrient solution, directly to the roots of plants continuously. System use less water and fertilizer as compared to soil system. Main parts of Automated System are PSoC4 CY8CKIT-049-42xx Prototyping kit, LCD, nutrient pump, water pump and relay.

KEYWORDS: Hydroponics, Psoc4, Time based method, Psoc4 Real time Clock.

I.INTRODUCTION

Hydroponics is method of growing plants using mineral Nutrients solutions in Water without soil. Hydroponics technique is best way to grow vegetables**,** fruits, plants without soil. Hydroponics can be grown outdoors, indoors even in small space. Hydroponic allow for crop to grow in area where Growing traditionally has been problem and the place where soil is poor and where water is minimum where farm land is too expensive.

Fig. 1   hydroponics system

In Hydroponics techniques plants are placed in growing medium and nutrients are delivered directly to roots. Plant May grow with their roots in nutrient solution only or inert medium. Hydroponic technique is Batter, faster way to grow plant than the growing plants in soil. Hydroponic provide better, more nutritional result with the efficient Use of water and fertilizer. Hydroponics allow farmers to grow more food in less space as compared to traditional Soil gardening. Vegetables, plants and flower can be grown on the roof of houses. Fruits grow in shorter period of Time as compared with soil system

A literature review describes project information. The purpose of literature review is to investigate the opportunities for implementation of hydroponic system, to investigate the possible applications of the technology and to determine a suitable design and functionality. many researchers discovered that plants are able to absorb and consume essential minerals in plain water. , but researchers found that plants were able to absorb these ions directly from solutions of water rich in these nutrients. They found that soil wasn't even a necessary component of plant. Research papers give basic idea to develop automated System for Hydroponics.

Some researchers M.F. Saaid, N.A.M. Yahya, M.Z.H. Noor, M.S.A. Megat Ali published their research paper. Paper describes the development of a automated Hydroponic system using Microcontroller In this research paper micro controller and sensor is use to control System for Deep Water Culture System.

A. Velázquez, M. A. Hernández, M. León R. B. Domínguez, J. M. Gutiérrez published their research work. This paper describes the development of Hydroponic a system for Cherry Tomato. The monitoring parameters for the nutritious hydroponic solution are the electrical conductivity.

Lenord Melvix J.S.M , Sridevi C. published their work. This paper presents an how nutrient solution can be supply using electronic system.

Researchers Saiful Farhan M. Samsuri, Robiah Ahmad, Mohamed Hussein, This paper describes the constitute of the control system of hydroponics nutrient solution automatic control of water, fertilizers and climate systems.

II.HYDROPONIC SYSTEM &TYPES

Fig. 2(a) basic parts of hydroponics system

Basic parts of hydroponics system

Grow Tray**:** grow tray is the part of the hydroponics system that contains growing media and plants. The plants roots grow in the tray.

Reservoir: The reservoir is the part of the system that stores the nutrient solution. The nutrient solution consists of plant nutrients that are mixed in water.

Submersible Pump**:** Submersible pump deliver nutrient solution by pumping the solution from the reservoir to the tray or plants directly.
Delivery Tube: The delivery tube is used to deliver the nutrient / water solution from the reservoir to the grow chamber tray.

Automated Timer: An automated timer is simple timer that allows hydroponic unit to be activated on a predetermined schedule.

Oxygen Pump: oxygen pump is use to oxygenate the nutrient solution.

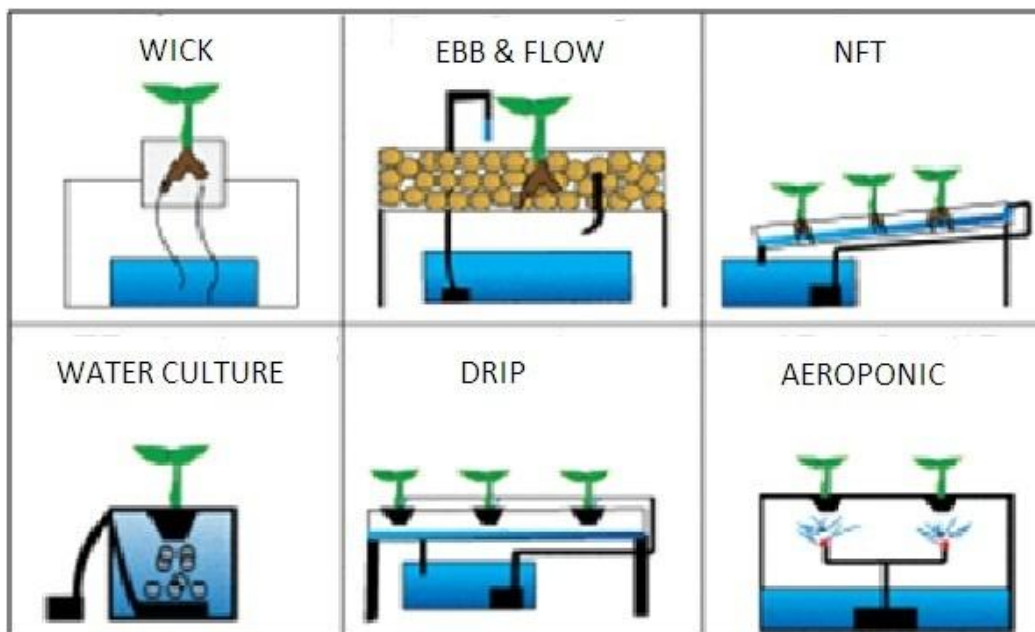**There are different types of hydroponic systems**

Fig. 2(b) basic types of hydroponics

Wick System: Wick System is a passing system, Wick system has no moving parts, nutrient solution is dripped into the grow tray through a wick.

Ebb and Flow System: flood tray are filled with a grow media. the liquid nutrients are allowed to ebb back into the holding tank from where they were originally pumped. This cycle runs continuously

Nutrient Film Technique System: nutrient solution is pumped into grow tray over plant roots.

Water Culture System: The plants are held, in a holding tank of nutrients.

Drip System: the nutrient solution is released onto the base of plants, and e nutrient solution is collected and reused.

Aeroponic System: In Aeroponic system plants grow in an air without the use of soil. The roots hang in the air, misted with nutrients solution every few minutes to ensure the plants have access to nutrients solution.

III. AUTOMATED HYDROPONIC SYSTEM

In Automated hydroponic system plants are placed in a growing medium and nutrients are delivered directly to the roots on the basis of time. Psoc4 is main part of automated hydroponics system. PSoC4 is a programmable embedded system with an ARM® Cortex™-M0 CPU. The PSoC4 Real-time Clock component is use to set Alarm for nutrient pump. Alarms are set weekly. When alarm is activated, Relay will be activated and nutrient pump will deliver Nutrient

solution for alarm time. When alarm is deactivated the relay will be off and nutrient pump will stop to supply more nutrients in to water

Fig. 3(a) automated hydroponics system

Fig. 3(b) hardware system

Another relay is connected with port of Psoc4. When port pin is high relay will be run the water Pump and when Port pin is low the water pump will stop to flow the water. Thus water recirculates regularly. The PSoC4 Real-time Clock component is use to set Alarm. LCD display is used to show the current time and date. Nutrient pump is used to add nutrients solution into water. Water pump is used to recirculate the water. Relay is use to set both pumps

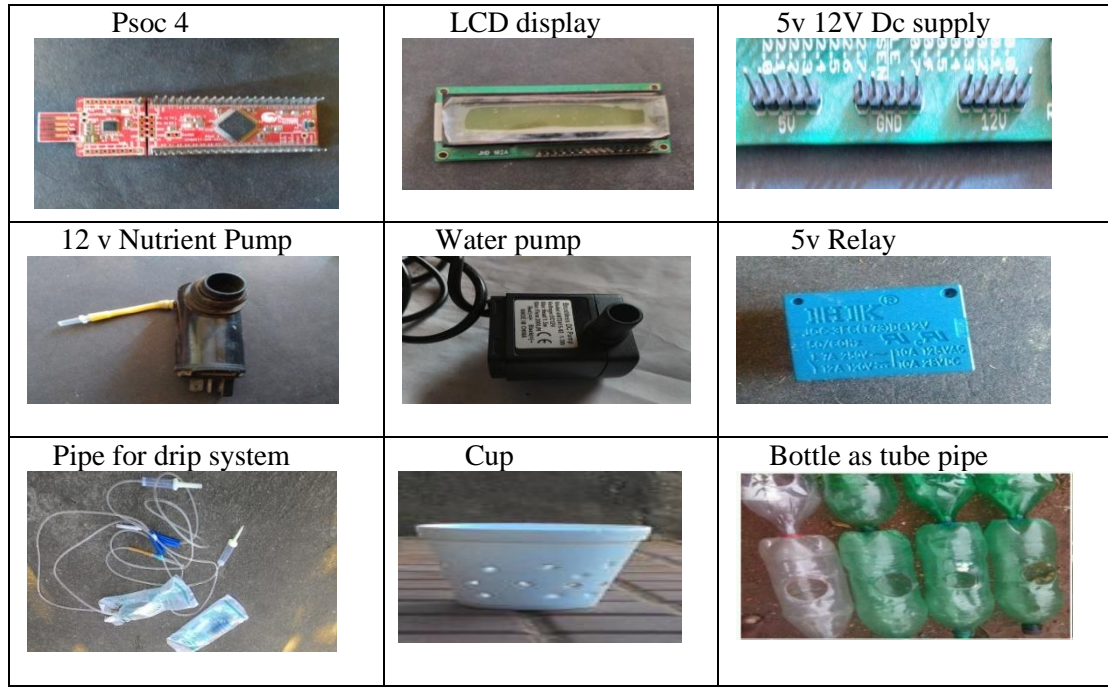| Psoc 4	LCD display	5v 12V Dc supply
12 v Nutrient Pump	Water pump	5v Relay
Pipe for drip system	Cup	Bottle as tube pipe

Fig. 3(c) basic part of automated hydroponics system

The PSoC4 Prototyping Kit requires Psoc creator software to compile c code. We can program The PSoC4 Prototyping Kit using Psoc creator software. To use the PSoC4 Prototyping Kit, we need to connect the kit to a PC. The kit is designed to be connected to the computer through USB.
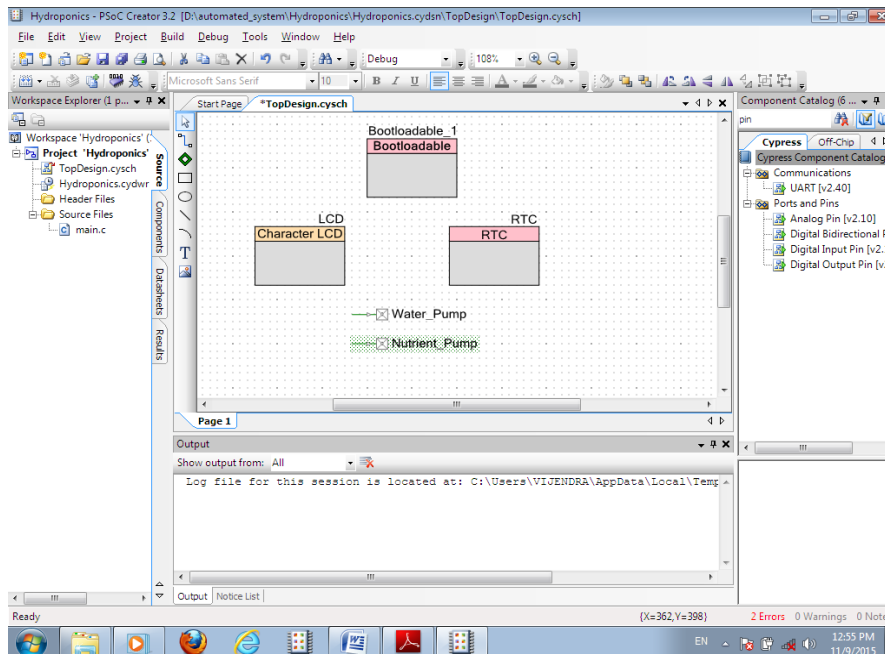

Fig. 3(d) PSoC Creator

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IV. RESULT AND DISCUSSION

Plant needs five things: food, water, light, air and support. We can provide all five in a hydroponic system. We saw that Hydroponics plant grows well with less use of water and fertilizers. Growth rate of hydroponics plant is 40-50 faster than the soil system

Fig 4(a) plants growths

V. CONCLUSION

This paper shows how automatic hydroponic system can be implemented using electronic circuit. It describes a how the mix of water and nutrient solution automatically delivered to the roots of plants. System automatically supply nutrient into Water in every week and regularly re-circulate mix of water and solution form reservoir. System use less water and fertilizer as compared to soil system.

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