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MONITORING AND CONTROL SYSTEM FOR WATER BASED AGRICULTURE

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ABSTRACT

Hydroponicsis a concept which is a part of hydro culture and is a method of growing plants in water , without soil using only the mineral nutrient solutions. The nutrients in hydroponics system can be from fish waste, normal nutrients, or duck manure. Hydroponics is a technique in which plant grow without using the soil. This technique take cares that the plant gets all nutrients which are required from the water solution. There are so many types of hydroponics technique. One of the techniques is Water Culture (WC). Water culture is a technique that supplies the nutrient directly to the root of the plant until the plant can be harvested. In this technique, the plant root will be always submerged into the water containing nutrient and oxygen. In this research, the pH level in water solution, water conductivity and the water luminosity which gives bad effect on growing of the plants will be automatically monitor by microcontroller ARM7 and sensors. The proposed system automatically monitors the parameters ph, luminosity and conductivity which are very important for plant growth. Luminosity is the very important factor for the any plant in growth. Requirement of luminosity is vary with plant and the luminosity is vary with environment. So, in proposed system luminosity is monitor and control.

Keywords: *Hydroponics agriculture, pH level, ARM, Embedded application, monitoring pH, luminosity and water conductivity.*

I. INTRODUCTION

In the last few years, there is a rapid change in the different cities of the world and in result, the farming in an urban area acquired a lot of attention. As the population increased in various countries like India, there is a necessity to upgrade their techniques in agriculture to meet the needs of the people. Soilless agricultural techniques like hydroponics have achieved a lot of importance these years. There are many advantages that hydroponics has over traditional soil-based gardening. This technique uses less water. It requires less space. In this technique, there is very low contamination and it can be done all year round. In addition to this, yield is more by using hydroponics Agriculture. Automation of Hydroponics is a very important technique that can solve many challenges in its implementation. All the procedures involved in hydroponics processing, monitoring parameters which is essential for plants growth is very important. In the proposed system, parameters pH, conductivity, and luminosity are monitored.

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II. METHOD & MATERIAL

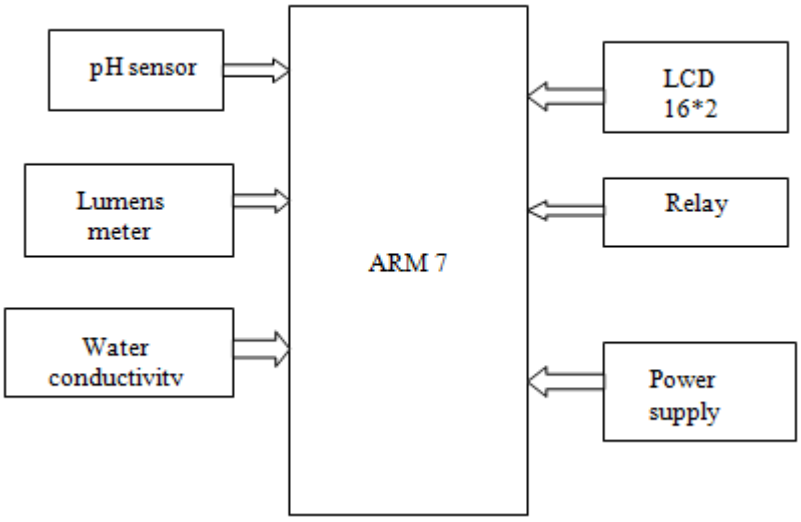

Fig.1.Block diagram

A) Hardware implementation

Microcontroller (ARM 7)

A general purpose 32-bit microprocessor is The ARM7TDMI-S is, which gives high-performance and it consumes a very low power. The architecture is based on Reduced Instruction Set Computer (RISC) principles, which consists of set of instructions and related decode mechanism which are more simple than micro programmed Complex Instruction Set Computers (CISC). This makes the system cost-effective in a high instruction throughput and plays an important role in impressive real-time interrupt response. There is a use of Pipeline techniques, which are employed to all parts of the processing and memory systems, so that they can operate continuously without consuming more time. Generally, when one instruction gets executed, at the same time the next instruction gets decoded, and during that same time interval, a third instruction is being read from that stored memory. This ARM7TDMI-S processor also contains a unique architectural strategy known as Thumb, which provides high-volume applications with some memory restrictions. There are some applications where code density can be an issue. The basic idea for using Thumb is to provide a super-reduced instruction set. It has two instruction sets:

The standard 32-bit ARMset and A 16-bit Thumbset.

Lumensmeter

Light Dependent Resistors (LDR) which is also called as Photo resistors which change resistance according to the intensity of light. As the resistance of Photo resistor (LDR) decreases the intensity of light falling on it increases. Photomultiplier tubes consist of a photocathode. The electrons are amplified by a chain of dynodes when the photocathode emits electrons when illuminated,

pH meter

It is a meter which is nothing but a scientific instrument which measures the hydrogen-ion activity in solutions which are water based. It indicates its acidity level or alkalinity level which can be expressed as a pH. The pH meter makes the count of the difference in electrical potential between reference electrode and pH electrode. ThepHmeteris also referred as a "potentiometric pH meter". The difference in electrical potential can be related to acidity or pH of the solution.

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Water conductivity

Conductivity means the capability of **water** to pass the flow of electrical signals. It is in direct relation with the concentration of ions in the **water**. These **conductive** ions generated from dissolved salts and various inorganic materials like chlorides, sulfides, alkalis, and different carbonate compounds.

Liquid crystal display

The most important use of LCD is in a project for visualizing the output of the various applications. Here,16x2 LCD is being used for the indication of 16 columns and 2 rows. So, there can be 16 characters for each line. So, in total, there are 32 characters which can be displayed on 16x2 LCD. It can also be used to check the output of different system modules which are interfaced with the microcontroller chip. Hence, LCD can play an important role in a project to display the output and to resolve the system module. If there occurs a case in which a system fails then it can be used to rectify the problem.

III. OTHER SECTIONS

Working analysis

In this research, I choose cucumber plant for a hydroponics agriculture. Initially, need to saw a seed to germination. Sequence of cucumber seed germination:

- Kept the seeds in Rockwool. Rockwool is the medium which holds the seeds. That Rockwool is first wet in pH water. For any type of seed pH required is 5.5-6. And the pH of tape water is nearly 6.9-7. So to down the pH used vinegar.

- Keep this Rockwool in dark place till seedgerminate.

- After 3-4 days seeds getsprouts.
- After 10 days, monitoring of the plant on daily basis is important.
- Hydroponic plants required light for 16 hours and complete dark for 8 hours. So, we continuous monitor and control the light.

Diagram showing the working analysis of system

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IV. RESULT & DISCUSSION

Measuring light continuously and display on LCD. Montoring and controlling of the lumens is done.

After taking care of these parameters, cucumber plant is bloosom. By using microcontroller monitoring of pH conductivity and luminosity is done. monitoring and controlling of luminosity is done for cucumber plant in hydroponics agriculture

V. CONCLUSION

Automation for the hydroponics plant is very important. In the previous researches, only pH is monitored and controlled. But in this research, the parameters conductivity, luminosity and pH is continuous monitor and the light is controlled automatically. Because light is the parameter which changes continuously. The monitoring of the parameter is done by the sensors and the controlled by the microcontroller ARM 7.

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