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Design of Wireless Sensor Network for Hydroponic System

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Abstract: Cultivation, adding up to an important aspect in GDP (Gross Domestic Produce), has been affected tremendously over the past few decades due to the use of chemicals. Due to rapid urbanization and industrialization, arable land under cultivation is decreasing enormously. Hydroponics is a method of growing plants purely using water and nutrients, without soil.The system facilitates the growth of multiple crops under AVR controller. Necessary supplements for the crops are provided based on the inputs obtained from the pH sensor and Temperature sensor and also Humidity sensor are used and also solenoid valve and relay are used in system .

Index Terms— Microcontroller; soil less cultivation parameter; Hydroponics; AVR controller.

I. INTRODUCTION

Cultivation of plants in water. It is technique for growing plants without soil. This technology use sensors to measure various parameters and produce crops without soil.Cultivation of plants without using soil. Now a days, chemical pollution and plastics are added with soil and produce soil pollution. More than a billion of people currently eating a harmful foods and create many dieses.So, we can produce without soil growing a crops, and this crops quality is good also supply these type of foods in rural and several area.Without use of soil growing a crops this system is called a Hydroponic system. Hydroponics is basically growing plants without soil. It is a more efficient way to provide food and water to your plants. Plants don't use soil – they use the food and water that are in the soil. Soil's function is to supply plants nutrients and to anchor the plants' roots. In a hydroponic garden, you provide your plants with a complete nutrient formula and an inert growing medium to anchor your plants' roots so they have easier access to the food and water. Because the food is dissolved in water, it goes directly to the roots. Plants grow faster and are ready for harvest sooner.Now a day in several countries are being implemented different soilless systems, farmers who choose to grow their products without using land as the basis for the growth of the same, they implement hydroponic farming, which is "growing in solid substrate for anchoring the roots"in Almeria there are thousands of hectares of hydroponic crops, areas which are one of the most important centers worldwide as far as the implementation of these cropping systems are concerned; the objective of this technique is the production of different types of vegetables in short and medium term, e.g. lettuce, tomato, pepper, among others.
Now a days, chemical pollution and plastics are added with soil and produce soil pollution. More than a billion of people currently eating a harmful foods and create many dieses. So, we can produce without soil growing a crops, and this crops quality is good also supply these type of foods in rural and several area.
Soil less agriculture in no mention of soil than soil pollution are not added in crops,foods etc. This system in given products are good for health and given production are under observation. Hydroponic system in crops are growing in water and this water quality are measure by PH sensor and also temperature and humidity are measure by sensors then production are good.

II EASE OF USE

Hardware Description

Hydroponic system in pH sensor and Temperature sensor and also Humidity sensor are used and also solenoid valve and relay are used in system. The water

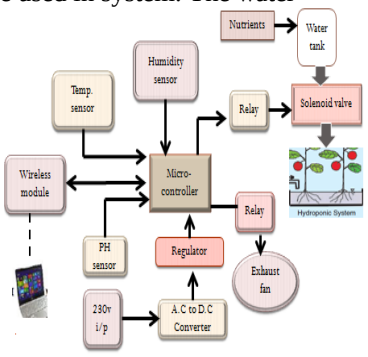

Fig. 1 Block diagram of system

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and nutrient supply to the different varieties of crop is controlled and monitored at regular time intervals and finally given output via wireless module.The system facilitates the growth of multiple crops under AVR controller.The system is equipped with a prototype wireless sensor module using controller supporting temperature, humidity, and water level data. In order to put the system into production, we developed a new sensor device that supports monitoring of EC (Electro Conductivity) for nutrient solution concentration, water temperature, and water level using a single module. While the module is very simple and low cost, it achieved high accuracy measurement.

III DESIGN METHODOLOGY

1. PH Sensor

Ph sensor is measure the water Ph.The whole process in all time same ph level water is supply then crops quality and quantities are better. Meters used in hydroponic growing take advantage of digital technology.pH testing is crucial to agriculture, health care, metal plating, food preparation (including brewing) and a host of other commercial pursuits.Hydroponic grows are especially responsive to proper pH conditions. But no matter the growing medium, great results come when pH is dialed in to the needs of each plant.

Fig.2 PH Sensor

2. Humidity Sensor

DHT11 Digital Temperature and Humidity Sensor is a Composite Sensor Contains a Calibrated Digital Signal Output of the Temperature and Humidity. Applications are Humidity Regulator, Medical and Other Humidity Measurement and Control. Features: Low Cost, Long-Term Stability, Relative Humidity and Temperature Measurement, Fast Response, Long Distance Signal Transmission, Digital Signal Output. DHT11 Temperature and Humidity Sensor features a calibrated digital signal output with the temperature and humidity sensor complex. Full Range Temperature Compensated. Relative Humidity and Temperature Measurement. Long Transmission Distance.

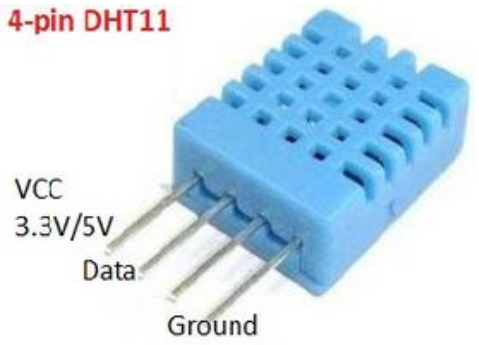

Fig. 3 Humidity sensor

3. Temperature Sensor

This is a waterproofed version of the DS18B20 sensor. These 1-wire digital temperature sensors are fairly precise (±0.5°C over much of the range) and can give up to 12 bits of precision from the onboard digital-to-analog converter.They work great with any microcontroller using a single digital pin, and you can even connect multiple ones to the same pin.

Fig. 4 Temperature sensor

4.AVR Controller

The Atmega328is a low-power CMOS 8-bit microcontroller based on the AVR enhance RISC architecture.Atmega328 are popular for low cost , wide availability ,large user base, free development tools and serial programming(and reprogramming with flash memory) capability so we are using this microcontroller.

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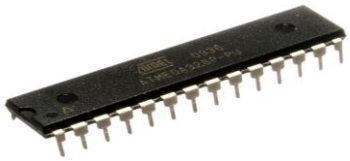

Figure 5 . AVR Controller

AVR Controller main features are 8-Bit Microcontroller Atmel® AVR® advanced RISC architecture.32KB of programmable flash,1KB of EEPROM,2KB SRAM.Single 16-bit Timer/Counter with an idependent prescaler, compare and capture modes. Programmable I/O lines is 23.Operating voltage is 1.8 – 5.5V. Operating temperature range is 40°C to 85°C.

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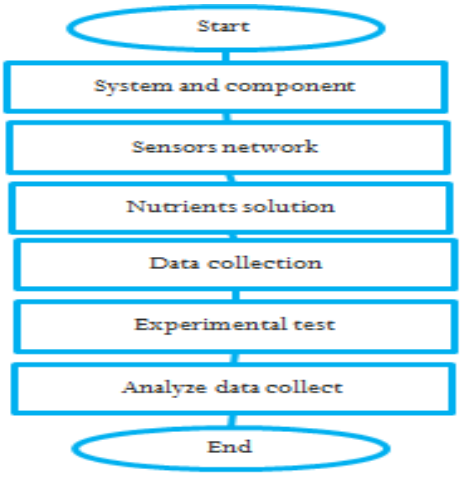

Fig.6 Flowchart

HARDWARE

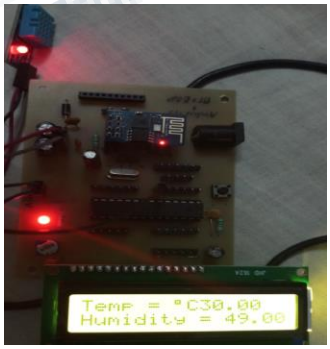

Fig.7 Hardware Device

CONCLUSION

By this system, In automatically collects big data from distributed soil-less food production systems and perform background analytics to adaptively control the water quality of each food production system. From the technological aspect, the development of a tool to monitor and effectively control the drip irrigation system based on the measurement continues in temperature, humidity, PH sensor on the floor using vernier sensors in the root zone is highlighted culture.

FUTURE SCOPE

Currently Temperature, Humidity, and PH sensors are interface with Controller in future Moisture and EC sensors part of the project will be implement .

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