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AUTOMATIC IRRIGATION SYSTEM FOR AGRICULTURE FIELD USING WIRELESS SENSOR NETWORK (WSN)

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Abstract - *In India, agriculture plays an important role for development in food production. In our country, agriculture are depends on the monsoons which is not sufficient source of water. So the irrigation is used in agriculture field. In Irrigation system, depending upon the soil type, water is provided to plant. The greenhouse based modern agriculture industries are the recent requirement in every part of agriculture in India. In this technology, the humidity and temperature of plants are precisely controlled. Due to the variable atmospheric circumstances these conditions sometimes may vary from place to place in large farmhouse, which makes very difficult to maintain the uniformity at all the places in the farmhouse manually. It is observed that for the first time an android phone-control the Irrigation system, which could give the facilities of maintaining uniform environmental conditions are proposed. The main objective of the present paper is to develop a smart wireless sensor network (WSN) for an agricultural environment. Monitoring agricultural environment for various factors such as soil moisture, temperature and humidity along with other factors can be of significance. A traditional approach to measure these factors in an agricultural environment meant individuals manually taking measurements and checking them at various times. This paper investigates a remote monitoring system using RF module. These nodes send data wirelessly to a central server, which collects the data, stores it and will allow it to be analyzed then displayed as needed and can also be sent to the client mobile.*

Key Words: **Irrigation System, Soil Moisture Sensor, Temperature Sensor, RF Module, WSN.**

1 .INTRODUCTION

Agriculture is the need of most of the Indians livelihood and it is one of the main sources of livelihood. It also has a major impact on economy of the country. A major quantity of water is used for irrigation system and therefore 85% of available fresh water resources are used for yielding agricultural crops. This resource of water will decrease day by day and consumption of water will dominate and increase more than 85% in upcoming half century. This is due to the high growth in population due to this tremendous growth in population there is huge demand for food. Agriculture is the main source for food production. Using science and technology we need to implement a method by which there can be limited consumption of water

Till date many methods have come into existence where water can be limitedly consumed. A method where monitoring water status and based on status of water whether it is high or low irrigation is scheduled which is based on canopy temperature of plant, which was captured with thermal imaging. Another method is making use of information on volumetric water content of soil, using dielectric moisture sensors to control actuators and save water, instead of the scheduled irrigation at a particular time of day and supplying water only for a specific duration. This above method just opens the valve and supply water to bedding plants when volumetric content of soil will drop below threshold value. In this paper a use of the second method where sensors are placed and based on that water is supplied to the field and intimated to the farmer using software application. Wireless sensor networks is also called as wireless sensors and actor network, are distributed spatially autonomous sensors to monitor physical or environmental conditions as temperature, pressure sound, moisture etc. and it co-operatively passes these data via network to the main location. WSN is built of few to several thousand nodes, where each node is connected to sensors each sensor network node has typically several parts: a radio transceiver with an internal/external antenna, a microcontroller, an electronic circuit for interfacing with sensors and an energy source such as battery.

2. PROBLEM STATEMENT

At present there is emerging global water crisis where managing scarcity of water has become a tedious job and there are conflicts between users of water. This is an era where human use and pollution of water resource have crossed the levels which lead to limit food production and low down the ecosystem. The major reason for these limitations is the growth of population which is increasing at a faster rate than the production of food and after a few years this population will sum up to 3-4 billion.

This growth can be seen in countries which have shortage of water resources and are economically poor. Because of growth in population there is a huge demand to raise food production by 50% in the next half century to maintain the capita, based on an assumption that productivity of existing farm land does not decline. The crop water stress index called as CWSI existed around 30 years ago. This crop water

stress index was then integrated using measurements of infrared canopy temperatures, ambient air temperatures, and atmospheric vapor pressure values to determine when to irrigate using drip irrigation

The management of these farms which are in greenhouses will require a data acquisition to be located in each greenhouse and the control room where a control unit is located. These are separated from the production area. At present, the data is transferred using wired communication called field bus. This data is transferred between greenhouses and control room.

Different communication technology has been developed for communication between network and its element. ZigBee, WI-FI, Bluetooth, RF are communication technology used in sensor network. RF is preferred over other technology due to low cost and less power consumption. Web based intelligent irrigation system is solution for this problem. It is automated and micro controlled based can be control from remote location. It takes decision on sensor value of agriculture farm. Wireless sensor Network is back bone of whole system. Sensor node, master node, Base station and server are elements of WSN application.

3. LITERATURE SURVEY

Before the start of the Project we had conducted the following survey on different things. They are as follows:

a) A Crop Monitoring System Based on Wireless Sensor Network.

Wireless sensor network crop monitoring application is useful to farmer for precision agriculture. The application monitors the whole farm from remote location using IOT (Internet of Things). Application works on sensor network and two types of nodes. Energy saving algorithm is used in node to save energy.

System having two nodes sensor node which collect all environmental and soil parameters value soil moisture, temperature, air, humidity, light, etc. and second node consist of cam to capture images and monitor crops. Crop monitoring application consists of two sensor node image sensor and environment parameter collector. These two sensors collect the information about crops. Image sensor collect crop growth, height and second sensor node collect data about humidity, soil condition, etc. and this information is collected at base station and then get transfer to internet (web application). Data analysis is get done at server side.

b) Automatic Drip Irrigation System using Wireless Sensor Network and Data Mining Algorithm

Data mining algorithm are used to take decisions on drip irrigation system. Automated drip irrigation system having WSN placed in all over farm and different type of sensors like soil moisture sensor, wind direction, wind speed, soil temperature gives reading to control station and base station.

WSN uses ad hoc network which gives self-configuration and flexibility. Sensor data is given to base station and data is received using ZigBee. Data processing is done at base station for decision making. Data mining algorithm is used to take decision on data from sensor to drip. All observation are remotely monitor through web application.

Data mining Naïve Bayes algorithm is used for decision making on data set which is real time feed from field sensor. Algorithm check probability of each attribute. Drip irrigation on and off decision are made. Previous data set of agriculture is provided to take decision. All data of field is given to web application for observation.

c) Wireless sensor network with irrigation valve control.

Wireless sensor network with valve control unit is developed with actuator hardware and software. Irrigation is control by actuator. Web application is used for manual control and schedule irrigation timing. Water meter indicate the requirement of water. Node unit contain soil moisture sensor and actuator. Two way communications take place from actuator to node and base station. Packet with control commands are sent between node and actuator. Actuator control solenoid valve depending upon water meter value and scheduling timing for water supply.

Packet loss between node and actuator communication degrade performance of system. Power requirement for actuator and node unit is high. Water requirement for different crop is different also depends on other factor like soil type, temperature, etc. This system measures only soil moisture parameter to take irrigation decision.

d) Wireless sensor network infrastructure for agriculture.

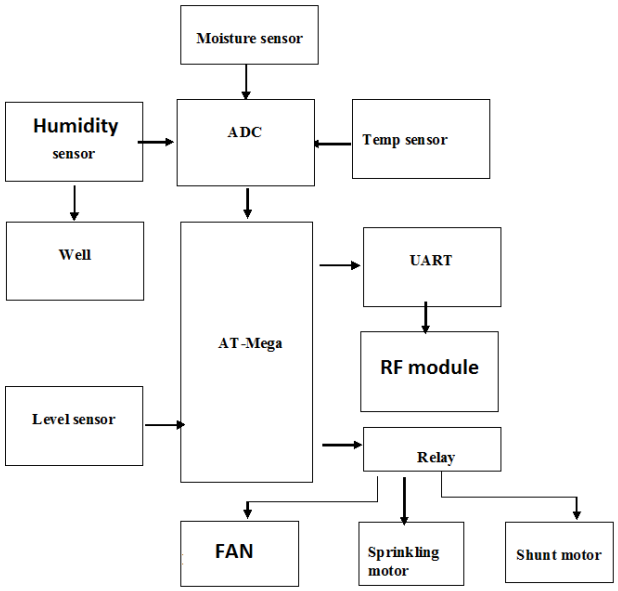
e)

Existing wireless sensor networks that monitor agriculture infrastructure measures different soil parameter and environment conditions. This WSN is composed of node with software and hardware units. Node has control unit which control sensors and communicate with base station. At mega and ARM are frequently used as control unit. ZigBee, Bluetooth, Wi-Fi used for transceiver in WSN.

Wireless communications take place between networks. Network report soil value, volumetric water contains, landscape movement, earthquakes and volcano information. Hybrid sensor network combine advantages of these two infrastructure system. When WSN is out offline of sight WUSN collect the information from node. Mobile information collected by terrestrial WSN.

4. BLOCK DIAGRAM

Block diagram of transmitter:



Block diagram receiver:

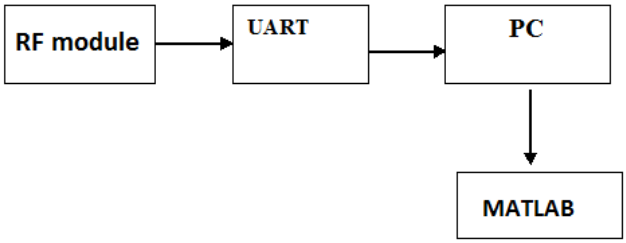


Fig4.1. Block diagram of transmitter & receiver.

5. WORKING PRINCIPLE

There are two sections in our project one is transmitter section which is placed in farm as sensors and another section is receiver section is users PC. Soil moisture sensor is used to measure the amount of moisture content present in soil. Moisture sensor data are fed to the microcontroller. Microcontroller acts according to the control algorithm. Sensor output is analog in nature in the range of 0-5v. Microcontroller converts analog data to digital data. When the moisture content present in the soil is dry, then water flow in a tank starts to flow in a pipe by turn ON the motor. When the moisture content in the soil is high, then the water flow in a tank stops to flow in a pipe by turn OFF the motor. The same moisture content and flow level will be displayed in LCD display of micro-controller. The sensor values are transmitted to the receiver through RF protocol.

At receiver the values of sensors are monitored on the user's PC through MATLAB application. Temperature sensor, level sensor, moisture sensor connected with AT-mega. Microcontroller transmits the data's using RF module this project offered stable remote access to field conditions and real-time control and monitoring of the variable-rate irrigation controller.

The main purpose of this project is to monitor the paddy crop field in a wireless manner. Here we sense the temperature, moisture and water level in the well using temperature, humidity and flow sensor respectively. The analog value from the sensors is converted to digital format by the ADC. The AT-mega controller gets the output from the ADC

6. CHALLENGES AND FUTURE SCOPE:

The future work is trying to improve the topology structure to make all nodes communicate with each other, also to improve the stability of wireless sensors in communication by better software and hardware design. Especially, a design of smart irrigation control system based on wireless sensor networks and implement irrigation decision by real-time humidity data and expert data. Moreover, design and implementation of software architecture for the smart monitor system need continuous improvement to meet various real demands change the font style.

7. CONCLUSION

By implementing this idea, we can improve the traditional way of agriculture irrigation system in different region of India.

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BIOGRAPHIES

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