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WSN Based Automated Irrigation System

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Abstract: ***In the field of Agriculture appropriate, use of water for different crop as per the change in temperature and humidity is very much essential. In conventional irrigation system, farmer must keep watch on irrigation timetable. To face the above loopholes, remote data collection, analyzing, monitoring ad controlling is used in this Project with the help of Wireless sensor network.***

Keywords: Wireless Sensor Network, Zigbee

1. Introduction

Wireless Sensor Network is spatially distributed network of sensor nodes from a few to several hundreds or even thousands, where each node communicating with one another and the central unit [2]. Each sensor nodes consist of some sensors and radio module along with an intelligent device. The signals from the sensors are obtained in Arduino and transmitted to the Irrigation Control Centre (ICC) via Xbee. If the value of sensed data is below the threshold values, then it will start irrigation automatically. GUI helps to make the system user friendly. In addition to displaying the data, system also have the facility of remote switch to turn motor on/off.

2. Motivation

In India, where the economy is mainly base on agriculture and the climatic conditions are isotropic and are not able to make full use of agricultural resources. The main reason is the lack of rains and scarify of land reservoir water. Thus for 'More Crop per Drop' need proper monitoring of their water requirement. But sometimes due to human ignorance some part of crop is not getting sufficient amount of water and thus percentage of production of crops reduces .The automated irrigation system provide use of water can be reduced for a given amount of biomass production and also reduces human power by automatically switching of pumps .The irrigation system can be adjusted to a variety of specific crop needs and require minimum maintenance. The modular configuration of the automated irrigation system can allow it to be increase for large green houses and farmlands.

3. Need of Project

In this 21st century Automation and Agriculture is the main and vast field for our country's financial system. So, we are trying to bring automation in the field of agriculture. Hence, we are implementing automated Irrigation system which helps in reducing the man power. This system also helps in remote monitoring of different parameter such as temperature and humidity as per the requirement from the different area of large farm.

4. Methodology

A. System Overview

The below figure shows the overall implementation of proposed system. The system consists of Xbee co-coordinator, router and end devices. The end devices present in the network collects the data from sensors and transmits the data wirelessly to the coordinator via router. The data collected by the co-coordinator is updated into the GUI (Central Unit). It helps in analyzing and decision making.

In this project we are using two unit: 1) WSU i.e. wireless sensor unit 2) WIU i.e. Wireless information unit.

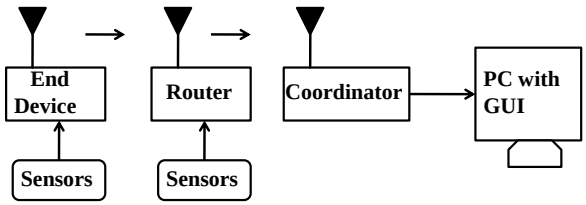

Figure 1: Design Overview

B. Hardware and Software Requirement

1) PC with MATLAB and Arduino IDE
2) Arduino UNO (Atmega 328p)
3) Temperature and Humidity Sensor (DHT11)
4) Soil Moisture Sensor
5) Xbee module (Xbee pro S2B)
6) Motor
7) X-CTU software

Wireless Sensor Unit: A WSU is consisting of RF transceiver, Sensors, microcontroller and power sources. A low cost, robust wireless sensor that provides long period of operability without maintenance. Wireless sensor node is made to communicate with a base unit. The sensor sense the data and it is collected by microcontroller. Several WSU can be inserted into the field to configure distributed sensor network for the automated irrigation system. Data collected by all sensor nodes is then transmitted to the Wireless Information Unit

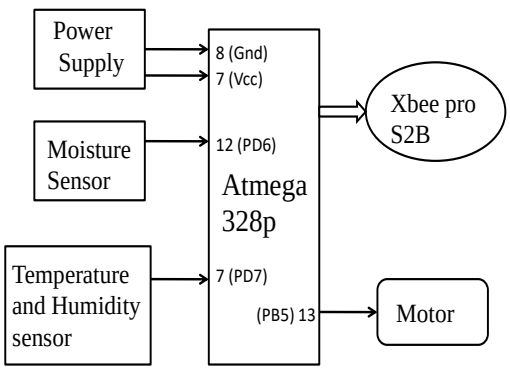

Figure 2: Wireless Sensor Unit (WSU)

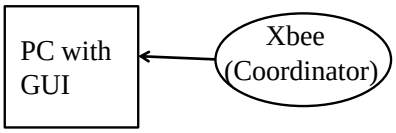

Figure 3: Wireless Information Unit (WIU)

Wireless Information Unit: This unit consist of PC and coordinator Xbee. Soil moisture, temperature and Humidity data are received, display and process using GUI (MATLAB)

C. Principle of Operation

1) Working of a WSU Unit: In this project MATLAB GUI is used to graphical representation of real time data collected from WSU. We are using 2 WSU i.e. Wireless sensor unit in which we are using Atmega 328p micro-controller and with that 2 sensors are interfaced and one Motor is fit at the field side .Sensors programming has been done using Embedded C(in Arduino IDE).
2) Proposed GUI: Above GUI is made with the help of MATLAB software. Node1 and Node2 are the buttons to get data of temperature and humidity from respective node as per the user requirement. GUI also have the option of automatic as well as manual controlling of motor. Automatic control will automatically turn the respective motor on or off based on the moisture in the soil.

Figure 4: Proposed GUI in MATLA

5. System Flowchart

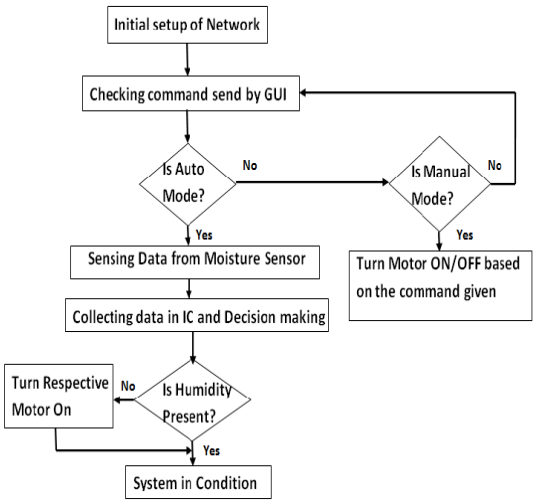

Figure 5: System Flowchart

In the above flowchart whole system process is shown from sensing of data from sensors up to displaying, analyzing and decision making.

6. Results

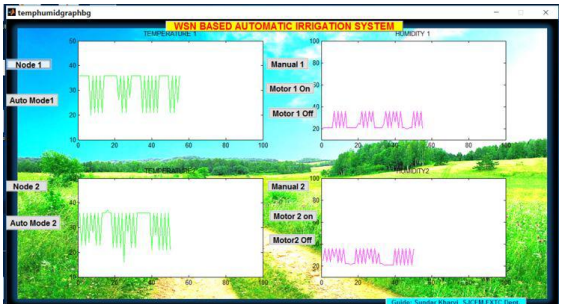

Figure 5: Graph of temarature and humidity in GUI

Above fig. displaed the real time reading of temparature and humidity for node 1(top) and node2(bottom) after pressing Node1 and Node2 button respectively.

7. Future Work

The power supply part of the prototype concerned is considered in two ways. One is dc power supply, the other is battery. The battery power supply is not very ideal in the actual application. Lithium ion battery is too costly and charging is a problem. So the power supply remains to be a problem to be solved.

8. Conclusion

Our system consists of star topology of sensor nodes which are communicating with central information unit. This paper presents design and implementation of WSN that help us in controlling and remotely monitoring of parameters such as temperature, humidity and moisture in a crop field, so we can reduce man power. This automated irrigation is very useful for optimizing water resources for agriculture production.

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