Wireless Sensor Network for Agricultural based pH Monitoring System

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Received date: 2nd April, 2018, Accepted Date: 24th April, 2018.

Abstract - The objective of the paper is to design low-cost Automation Irrigation System using a Wireless communication. The automated irrigation system is presented using wireless sensor and microcontroller. This implementation demonstrates not only automated irrigation system but also monitor the fertilizer level of the soil from PH sensor. It automatically sprays out the fertilizer when the soil needs to improve the crops yielding. Thus this project can be used to reduce the human power and water usage. The microcontroller is used for data acquisition and processing the data received from the sensor nodes. The sensor measurements are transmitted to a microcontroller-based receiver. This gateway permits the transmitter to transmit the values of soil moisture and temperature when the user needs. WSN Communication will control the irrigation system between the sensor nodes and the data received via the GSM in an efficient way. This controlled can be executed both automatic mode and manual mode. Because of its energy autonomy and low cost, the system has potential use for organic crops, which are mainly located in geographically isolated agricultural areas where the energy grid is far away.

Keywords – Wireless Sensor, Wireless Communication, GSM, PH Sensors, Microcontroller.

I. INTRODUCTION

At the present era, the farmers have been using irrigation technique in India. At the regular intervals, the farmers irrigate the land through the manual control. The global irrigation scenario, however, is characterized by poor performance, increased demand for higher agricultural productivity, availability of water for agriculture is decreased, increasing soil salinity and possible effects of global warming and climate change. The water reaches late due to which the crops get dried or sometimes consumes more water in this process. Water deficiency can be detrimental to plants before visible wilting occurs. Lighter weight fruit follows slight water deficiency because of slowed growth rate. This problem can be perfectly rectified if we use automatic microcontroller based soil irrigation system in which the irrigation will take place only when there will be an intense requirement of water. The intelligence scheme which is monitors the soil humidity and temperature of the agriculture field is an effective approach for the modernized agriculture also it deals with to reduce the human power source of the farmer and the reduce the water wastage and prevent the damage of the motors. Because of its low cost and energy autonomy, the system has potential use for organic crops, which are mainly located in geographically isolated agricultural areas where the energy grid is far away.

We propose a system that consists of a sensor module along with the WSN, used to transmit the data packets in wireless. The soil moisture sensor and temperature sensor and PH sensors are monitoring the agriculture field. Then this data sent to the microcontroller unit. It displays on the LCD. The value of the sensor range can be observed by the user in two ways. One is automatic mode and manual which is done through GSM. In manual mode, the user can control the motor when it needs to turn ON. Thus our project is designed for low-cost atomization of the irrigation system in a smart way.

II. EXISTING SYSTEM

Most of the systems based on Internet monitoring require higher operational cost based on bandwidth/data speed requirements and hence is justified only in biomedical applications or industrial in developing countries. These systems generally do not have alert facilities against the occurrence of abnormal conditions. In this existing system, the human resource is needed to control the motor depending on the temperature and humidity of the agriculture field. To overcome this, the internet-based approach is designed in the existing system. The cost of the system will be high due to the development of a website. It is difficult to upgrade existing conventional control systems with remote control capabilities.

A. Drawbacks

- Implemented Via the Internet.
- Fixed Control for manual irrigation with a button.

- Manpower is required to monitor the agriculture field.
- High Cost.
- The motor can be controlled [ON/OFF] via WIFI.

III. PROPOSED SYSTEM

The soil moisture sensor and temperature sensor and PH sensors are monitoring the agriculture field. Then this data sent to the microcontroller unit. It displays on the LCD. The value of the sensor range can be observed by the user in two ways. One is automatic mode and manual which is done through GSM. In manual mode, the user can control the motor when it needs to turn ON. Thus our project is designed for low-cost atomization of the irrigation system in a smart way. The intelligence scheme which is monitors the soil humidity and temperature of the agriculture field is an effective approach for the modernized agriculture also it deals with to reduce the human power source of the farmer and the reduce the water wastage. Because of its low cost and energy autonomy, the system has potential use for organic crops, which are mainly located in geographically isolated areas where the energy grid is far away. The system consists of Sensor which is connected to a microcontroller for processing, this microcontroller has a power supply and GSM modern for transmission of data.

A. Block Diagram

Figure 1 shows the overall architecture of how the microcontroller is connected to the sensors to collect the data about the agriculture field and process the data. Based on the output generated the microcontroller will informer the farmer about the soil moisture, temperature, and humidity. This helps the farmer to take proper decision on what the crops must be cultivated. This also helps the farmer to irrigate the soil in right time.

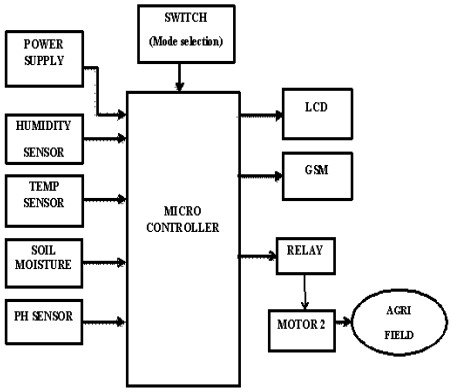

Fig. 1 Block diagram of the Proposed System

B. Power Supply

230V power source is available in AC voltage. Since our electronic circuits require only very minimal voltage and current we use the step-down power transformer. The input is 230V and output of 12V is designed based on Step down transformer. Another thing is that electronic circuits operate in DC whereas the available output of the transformer is Ac of 12V. Converting AC to DC is used for the rectifier circuit. Rectifier circuit consists of four diodes formed in bridge fashion so as to convert incoming AC to DC.

C. Micro Controller Unit

PIC is a single-board microcontroller and it can automatically reprogram itself. Data memory and program memory are separated. The hardware consists of an open-source hardware board designed around an 8-bit Atmel AVR microcontroller or a 32-bit Atmel ARM. The software consists of a bootloader and a standard programming language compiler that executes on the microcontroller

D. GSM Modem

A GSM modem is a wireless modem that works with a GSM wireless network. A dial-up modem works and acts as a wireless modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line. Through radio waves, a wireless modem can send and receive the data.

E. Advantage

- Implemented via GSM Automatic mode.
- Fixed Irrigation if anyone sensor reaches their threshold value.
- Status of the agriculture lands can be a monitor at any time and anywhere.
- Low Cost.
- It can be overcome by GSM module (SMS).

IV. Conclusion

A methodological approach has been followed in designing the Sensors based system for measurement and control of the plant growth parameter, i.e. soil moisture. The irrigation system will be controlled via WSN Communication between the sensor nodes and the data receiver is via GSM. The results obtained from the measurement have shown that the system performance is quite reliable and accurate. Field experience has shown that diagnosing the changes needed and to fine-tune irrigation practices are used in soil moisture sensors. Relatively minor regulations in irrigation practices can pay large dividends in terms of water savings or increased yields. The key to proper irrigation management using soil moisture sensors is regular monitoring of the sensors to track the soil moisture level and provide irrigation to the determined range for the particular soil type.

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