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RESEARCH ARTICLE

IMPLEMENTATION OF INTELLIGENT IRRIGATION SYSTEM

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ABSTRACT

Irrigation is quite time consuming process if it is not well managed by user. Hence this system stands for the need of automated irrigation system. In this system two micro-controllers are used. One at pump site and another one is at field. When moisture level is above threshold voltage the automated commands are sent through interface and valves is switching ON or OFF. GSM Module is used to keep updated to user. ZigBee module is used in this system to interface both the controllers. Hence this system have proven best to reduce time consumtion while irrigation. Aim is to design low cost and simple design by considering users are mainly farmers. Water wastage is reduce will be reduce by certain amount by implementing this automated system.

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INTRODUCTION

Agriculture is one of the most important fields where water is required in tremendous quantity. In many of Asian countries like India where development is mainly based on agriculture land products which tends to the rapid improvement in food production. Climatic conditions like mansoon are changing throughout the year and still we are not able to make full use of agricultural resources. The continuous extraction of fresh water from land is reducing the underground water level due to which water level under the soil is reduced to some extent. Another very important reason of this is due to unorganized use of water due to which a amount of water goes waste. Wastage of water major problem in agriculture. Every time excess of water is given to the agricultural fields with direct method which is more than enough. There are many techniques to save water or to control amount of wastage of water from agriculture land. Now a days, lack of water reservoirs and proper habitat is becoming one of the biggest problem in the world. There are different methods developed for conservation of water. In our day to day life also water is most essential part. Water is considered to be basic need of human as well as animals.

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Block Diagram

The overall irrigation system below mentioned modules as shown in block diagram. This system is divided into 2 parts. All modules are interfaced as shown. Block diagram are consist of 2 microcontroller. One is ARRM and another one is Arduino. This controller are interfaced with various puerperal components as shown.

System Modules

Sensor

Sensors of Irrigation system are complimentary units that attach to an irrigation controller and either modify the programmed irrigation cycle or stop the irrigation controller altogether. They can be inexpensive devices and they are easily added to most automatic irrigation systems and ensure the landscape isn't overwatered, reducing the amount of water wasted. Sensors are used to take measurement from remote side to the master unit.

Moisture Sensor

Soil moisture measurements is one of the easy and simplest way to get feedback in form of digital or analog value from sensor to help make improved water management. These are

sensors which modify the pre-set irrigation run time based on the amount of moisture in the soil. i.e. if it has watered or rained recently and the soil is moist, it will either reduce the run time or may even stop the program. It takes its input from the soil. If there is less moisture in the soil, the sensor would give an Analog input to the micro controller.

Temperature Sensor

Sensors which having less cost is used to regulate the irrigation cycle based on the current climatic conditions and the plants estimated demand for moisture. Hence they are used to check environment temperature surrounding the crops. In this system LM35 sensor is used.

Valves

Valves are devices used to control the flow of water. Most irrigation systems have both manual and automatic valves as part of the system. These automatic valves are operated from the controller that turns the water on and off to individual 'stations' or zones in the landscape. The term 'solenoid' refers to the electronic plunger located at the top of the valve body that turns it on or off when power is sent to it from the controller. Most solenoid valves also have a 'bleed' screw or switch on the valve body that is used to turn the valve on manually and is also helpful in flushing debris from the valve. Always use this when turning the valve on manually in the field. Pressure valves are valves installed after the filter on a drip irrigation system. They can be pre-set to the required pressure and make ensures that the system is operating at its optimum requirement with great performance.

ZigBee

ZigBee is a very cheap, power efficient and wireless device.. The low cost of it, allows this technology to be widely design in wireless communication, monitoring and automated applications, the low power requirement is efficient and allows a longer life with the small size batteries, and the mesh networking of ZigBee provides high reliability and larger range with simple network. ZigBee is designed to meet the high demand for capable wireless networking between numerous low power devices

Microcontroller

This System requires two microcontroller. One at field site and another one will be at controller station. To design cost efficient irrigation system we proposed to use chip microcontroller at field which will be ARM controller. Other one will be Arduino.ARM controller is used for interfacing sensors at field site and along with GSM Module and ZigBee. This controller sends command to water pipe valve to control the water flow.LPC2148 is used at field site for interfacing water pipe valve. Arduino controller is used for interfacing Motor valve and ZigBee. This controller is situated at river or any water resource site. Signals received from ZigBee is used to switch the valves at pump. Atmega328 is used for interfacing valve at pump.

GSM Module

Communication between user and micro-controller is taken place using GPRS. For this GSM module will be used. SIM card need to insert in GSM module for sending alerts to the end user i.e. farmer. GSM module sends SMS on every changes of threshold value.

Power Supply

In this system power supply in needed for both micro-controller. Hence 9V adapter is used to provide power supply.

Methodology

There are several traditional methods for irrigation. Drop irrigation and sprinkler irrigation are some popular methods. Hence I have chosen sprinkler method for irrigation. ARM controller is set at filed site. Arduino is connected to the water pump, the send a signal to microcontroller and the value is then closed. Two microcontrollers is connected using ZigBee. When moisture of the soil become low moisture sensor senses it and it sends signal to microcontroller, then the microcontroller sends the signal to mobile and it gives commands the controller which switches the valves of water pump pipe.. This indicates that valve needs to be opened by pressing the button in the called function signals are sent back to microcontroller and another end of the pipe is at root of the plant. The flow of water is managed by solenoid valve. The switching i.e. opening and closing of valve is operates when a signal is being passed through the ZigBee. The water to the root of plant is by sprinklers using motor in it.

RESULTS

The system works under some defined condition. Readings are taken for chilly plant which taken as an example. We can change the valves as per variety of plants.

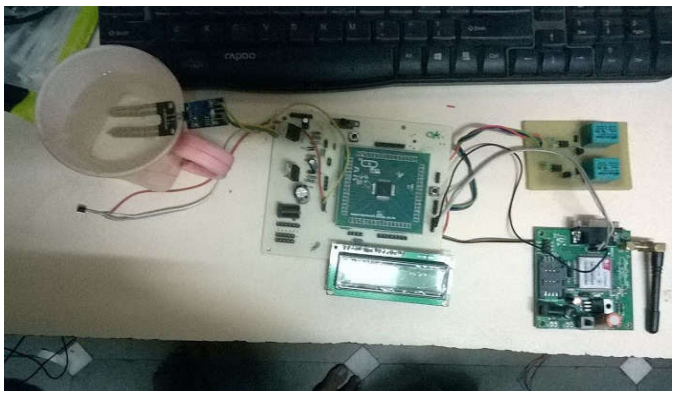

Fig. 1. Experimental setup

In above figure experimental setup is shown, Controllers, LCD Display, GSM Module, Sensors are connected as shown in block diagram. Relays are used for experimental purpose instant of valves. The hardware modules contains input an outputs for system. Sensors works as input and valves works as

a output. Threshold point is set at 3.5V for sensing moisture and to make relays ON.

Table 1. System status update for user

Moisture Level	Valve Status	SMS Sent
>3.5V	OFF	"Soil moisture level is HIGH, Motor and valve is OFF"
<3.5V	ON	"Soil moisture level is LOW, Motor and valve is ON"

While designing this system I taken some test SMS on mobile. I have taken one bowl with water and another is with dry soil. Now at first step sensor is dipped into water so that moisture level will be at 100%. And I observed that the SMS received is Soil moisture level is high. Now at second step same sensor I borrowed in soil and observed the SMS. At this time SMS received is Soil moisture Level is LOW, Motor and valve is ON. At the same time relay switch gets ON and valve stared working.

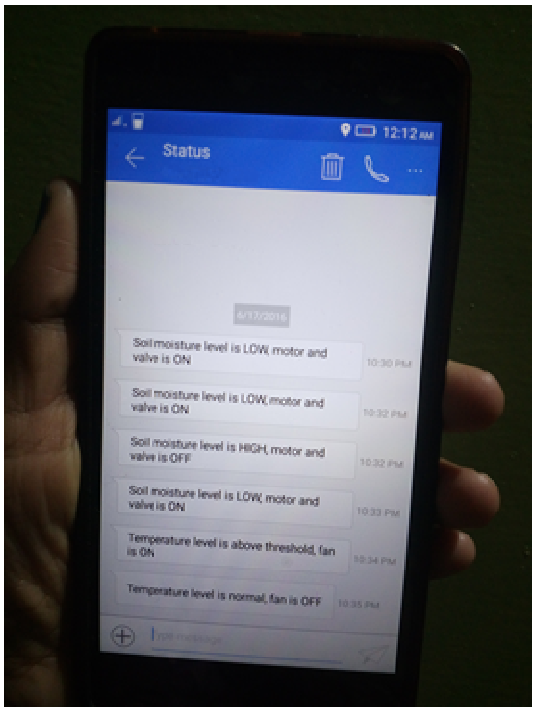

Fig.2. System status updates received to user on mobile

Conclusion

In this paper, I have designed a new irrigation system with a recent technology. This system is designed keeping in mind requirements of a farmer. Hence this system is quite simple and cheap. I have studied the different traditional irrigation system and based on that data is gathered and using controllers, sensors and valves this system is designed. In this system two micro-controllers are used. One at pump site and another one is at field. System is proved quite simple and easy to use. By making use of solar panel for power supply, this system will become ecofriendly.

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