International Journal of Contemporary Research in Computer Science and Technology (IJCRCST) e-ISSN: 2395-5325
Volume1, Issue 2 (May'2015)

AUTOMATIC IRRIGATION CONTROL SYSTEM FOR EFFICIENT USE OF WATER RESOURCES BY USING ANDROID MOBILE

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***Abstract*- Agriculture is a source of livelihood of majority Indians and has great impact on the economy of the country. In dry lands or in case of insufficient rainfall, irrigation becomes difficult. So, it needs to be automation required for proper yield and handled remotely for farmer usage and safety. In this paper we suggest a Wireless sensor network and Embedded based technique to control water flow level for sectored, sprinkler or drip method section irrigation system. This system will be very economical in terms of the hardware cost, man power, and power consumption. In places such as agriculture land areas must be a continuous need for monitoring the water level at particular field. In places such as drip irrigation for coconuts, bananas and some vegetable plants, the water is let out through pipes directly to each field. A person has to carefully watch the water level at regular intervals. His job becomes difficult at night times and for frequent power cut. Sometimes there is wastage of water and electricity due to negligence and other times there is a hard job for the formers. This is highly helpful in places such as drip irrigation system where there are many flow pipes but does not require any change in the agricultural fields. When the motor is switched on the sensors are activated and the fields are irrigated automatically without man power. Once the water reaches a particular level which may take several hours, this system takes appropriate steps to regulate or even stop the water flow.**

Keywords- Wireless Sensor, Network, Android mobile, GSM, Microcontroller.

1. INTRODUCTION

The continuous increasing demand of the food requires the rapid improvement in food production. In a country like India, the country economy is mainly based on agriculture and the climatic conditions are isotropic, still we are not able to use of agricultural resources and technologies. The main reason is the lack of rains & scarcity of land water reservoir. The continuous extraction of water from earth is reducing the water level due to which lot of land is coming slowly in the zones of un-irrigated land. Another important reason of this is due to unplanned use of water due to which a significant amount of water goes waste. At the present, the farmers have been using irrigation technique in India through the manual control in which the farmers irrigate the land at the regular intervals. So, this process sometimes consumes more water or sometimes the water reaches late due to which the crops get dried.

Automated irrigation system uses motor valves to turn ON and OFF. These valves may be easily automated by using controllers. Automating farm or nursery irrigation allows farmers to apply the right amount of water at the right time, regardless of the availability of water and labor to turn valves ON and OFF. In addition, farmer using automation equipment are able to reduce runoff from over watering saturated soil, avoid irrigating at the wrong time of day, it will improve crop performance by ensuring adequate water and nutrients when needed. Automatic irrigation is a useful and valuable tool for accurate soil moisture control in highly specialized greenhouse vegetable production and it's simple, precise method for irrigation. It also helps in time and energy saving, removal of human error in adjusting available soil moisture levels and to maximize their net profits.

2. RELATED WORKS

Over so many years wireless sensor network technology has tremendously indulged with the success rate in remote monitoring. Accordingly a system is designed to monitor the irrigation to the land using the diverse measure of canopy temperature. Using the thermal imaging and with the assist of embedded sensors and microcontroller irrigation is scheduled automatically [1]. The other system is enhanced with zone specific irrigation optimizes the water

usage as well as increases the crop yield. A precision irrigation based on closed loop zone specific data is used to provide an effective usage of water. Soil, crop and climate in the field are monitored to provide a decision support system. This is able to deliver the necessary treatment according to the monitored data [2].

The distributed in field sensor based irrigation increases the productivity while saving the water. This paper explains the detailed design of variable rate irrigation with wireless sensor network and software for real time field sensing and control of site specific precision linear move irrigation system. The Bluetooth wireless technology offers a plug and play module which saves the time as well as inexpensive [3].The GSM based drip irrigation methodology gives the facilities of maintaining uniform environmental conditions all over the green house. This system covers only lower range of agriculture land. The cost spend to develop the system is high for such low covering area. Hence it's not economically benefit [4].

WSN in climatic parameter monitoring is the energy efficient inexpensive technology. In case of long distance or impossible transport to check the actual environment conditions these networks are deployed to provide a data about the environment. Any physical parameter can be converted to electrical signal using WSN and the multi hop network would transfer the data to the destination [5].

3. EXISTING SYSTEM

Sprinkler Irrigation

Water is distributed through a system of pipes usually by pumping. It is then sprayed into the air and irrigates theentire soil surface through spray heads so that it breaks up into small water drops which fall to the ground.

Drip Irrigation

Water is allowed to drip slowly to the roots of plants or soil surface or directly on to the root zone, through a valves, tubing, pipes, and emitters.

Scheduling overhead irrigation

Based on the volumetric moisture in the growing substrate and plant Evapo Transpiration (ET) the irrigation to the land is controlled.

Precision linear-move irrigation system

A distributed sensor-based automatic site-specific irrigation system is implemented to increase yield and quality while saving water.

4. PROPOSED SYSTEM

The area which is to be irrigated will be divided into a plurality of discrete zones of possible different soil conditions, where each zone includes moisture sensor, temperature sensor and solar panel. A solenoid valve having an "on" state and an "off" state for controlling the flow of water to the required field moisture sensor disposed in the soil in each of the zones, when interrogated, it produces an electrical signal proportional to the level of moisture in the soil approximate that sensor. The sensor gives an alert / intimation about the dryness of the land to the moisture sensing unit that will be displayed in the LCD display in the GSM method. The result from the sensor switches ON or OFF the water irrigation system used to pump the water for the fields.

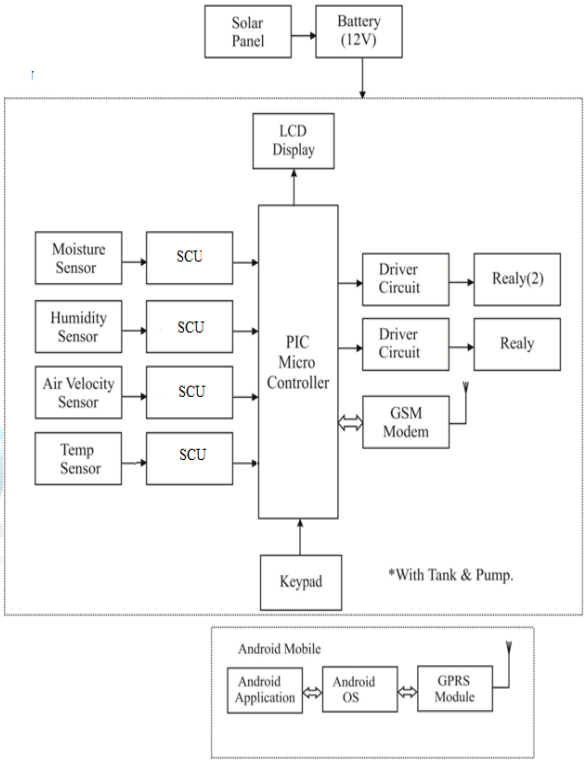

Fig 1: Block diagram of automated irrigation system using mobile technology

Technical Background:

The main theme is to control the water management for an irrigation system by automatic method does not require any manual operation. The important parameters are soil moisture sensor and temperature sensor; the sensors sense the temperature level and soil moisture level in the atmosphere, based on transmit the signal by A/D converters to microcontroller. A microcontroller turn ON the relays to run the motor and to open the solenoid valve for specific fields and the water supply is made through the system to field. In this project, we use microcontroller to control the overall system functions, it is the brain of the system. We use soil moisture sensor and temperature sensor, which are the main parameters in this system. A 16x2 display is used

to display the soil moisture content and temperature. The sensor signals are transmitted wirelessly by A/D converters to the microcontroller in the control room. For the purpose electricity a solar harvester fixed in the control room. It work automatically and does not require power from external source and the turn ON the relays to run the motor and open the solenoid valves to supply the water to the specific field. The relays are controlled by high current driver ICs. After some period of time the moisture content in the soil increases and it affect the crop. The moisture sensor transmits the signal to the microcontroller and turn OFF the motor power supply. When the motor turn ON or OFF a message will be sent to the farmer's though mobile.

5. PROPOSED SOLUTION

The input components used in the system are:

Power supply:

A 230 volt input AC supply is given to the transformer unit. It steps down into 12V AC supply and it is fed to the 7805 & 7812 Regulators converts it into regulated 5V&12V DC supply. It is distributed to all the driver, relay and control circuits. A 5V is given to the microcontroller and to all ICs used in the control system.

Temperature sensor: It is a measure of temperature at different levels of the Earth atmosphere. It is collected by many factors, including solar radiation, altitude and humidity. Here, we are using the thermistor (temperature sensitive resistor) for monitoring the soil temperature at regular intervals with the help of temperature sensor. When it exceeds the particular temperature level, it sends the signals to the microcontroller unit. Then the process is carried out, it turns the motor supply ON and sends the water to the field.

Soil Moisture sensor: The health of a plant is influenced by many factors; most important is being the ready availability of moisture in the soil. Crops always depend more on the moisture available at root level. We are using the moisture sensor to monitor the moisture content of the soil. It is used to sense the moisture of the soil and sends the signals to the control system, if the moisture level reaches the preset value. Then the water is sent to the field. They are precise, never wear out, do not need calibration, work under many environmental conditions and are consistent between sensors and readings. sensors are not expensive and quite easy to use.

The output components used in the system are:

Microcontroller: This stage converts the water flow rate, air humidity, temperature, wind speed and light intensity to the actual well balanced readings. A microcontroller accepts data from sensors and compares data with the pre-set actual values, corresponding signal is generated. According to this, the relay can switch on and off. Simultaneously it will send all sensor data from SIM300 to mobile user at control unit. When we want to read data of all the sensors monthly/yearly we can access that data from external memory storage.

GSM modem: Short Message Service uses GSM techniques to transfer data from distant places such as from one area to the area of the same city or another city .In our project we are using SMS technique to instant or quick transfer of data or notice to the exact destination. It is a convenient facility provided by the GSM network. A message length maximum of 160 alphanumeric characters can be sent to the mobile station. If the subscriber's mobile unit is powered off or has left the coverage area, the message is stored and return back to the subscriber when the mobile is powered on or has re-entered the coverage area of the network. This function ensures that the message will be received. In this project we are using SIM300 for transfer of data from weather station. SIS is the leading manufacturers of GSM modems in India.

Solenoid valve: Solenoid valve is an electrically operated device which consists of an energizing coil and a soft iron piece with a valve which cuts off or supplies the water. When supply is given to the coil it energizes and pulls the valve and the valve opens and water flows. When the coil de-energize, the valve closes automatically due to spring action and cuts off the supply of water.

Relay: Relay is also an electrically operated device which consists of operating coil and two contacts of Normally Closed, which is elaborated as Normally Closed and Normally Open contacts. When there is no supply to the coil there is no change in the contact position. When supply is given to the coil the contact NO closes and NC opens. It is unchanged until the coil is in energized condition.

Organization of the report: The field work was carried out at the field near to our college. The scope of the project can be is discussed as below:

Design and development of the control system: It is important that measurements are made regularly and recorded systematically to allow improvement in irrigation scheduling and soil/plant management. The need to determine the moisture status of the soil is a critical factor influencing plant growth. Moisture content of the soil is a important factor determining plant's growth in irrigated systems. The basic objective of irrigation system is to minimize water stress of the plant, over irrigation, and under irrigation. The basic requirement is collect regular data for monitoring the system. The ability to accurately measure soil water level, plant size and condition is an integral mechanism in the process of developing an irrigation

scheduling program that allows a better understanding of soil water and plant relations. The objective of present work is to get an efficient weather and moisture monitoring system. The system is more reliable in any situation and consistent in data transmission. To achieve this objective, GSM modem- SIM300 as a transmitting media is chosen for better communication.

6. MODES OF OPERATION

A. Humidity Settings Manager

This module is used to check the moisture content around the field. The moisture sensor is connected to the 8081 microcontroller which in turn is connected to the water pump starter unit; it will sense the moisture surrounding the field area. If the moisture rate is below the threshold rate that is mentioned while developing the embedded system, the motor pump will be switched on automatically. Unless if the moisture rate is above the threshold rate then the motor pump will not be turned on. The Humidity mode set by sending an SMS as SET1 to the GSM modem in the embedded system connected to the system.

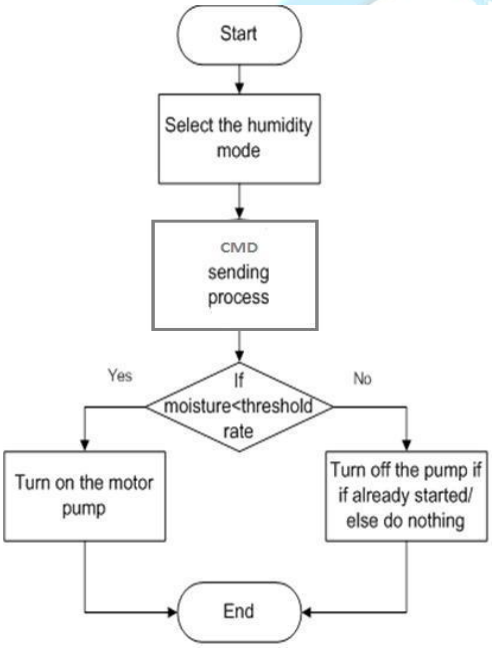

Fig 2: Flow Chart of Humidity Mode

B. Automatic Motor Controller:

This module is used to control the water pump automatically. The water pump will be turned on automatically every day at a particular time for 5 minutes, immediately after 5 minutes the pump will turns off. The turn on and off mechanism will work for the moisture rate around the field area. This automatic mode can be set by sending an SMS as SET2 to the GSM modem in the embedded system connected to the system.

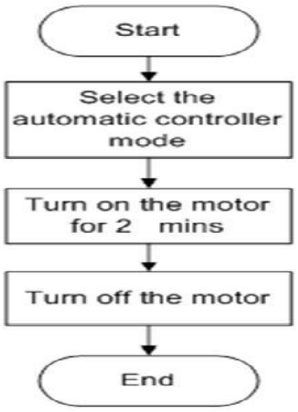

Fig 3: Flow chart of Automatic Mode

C. Manual Controller Manager

This module is used to control the water pump semi automatic, though without farmer's physical presence. We can turn on/off the pump when we require it. There is no particular time to switch it on or there is no time limit when to turn it off. This manual module works just by sending an SMS as ON to switch on the motor and OFF to turn off the motor. This SMS has to be sent to the GSM modem in the embedded system connected to the system.

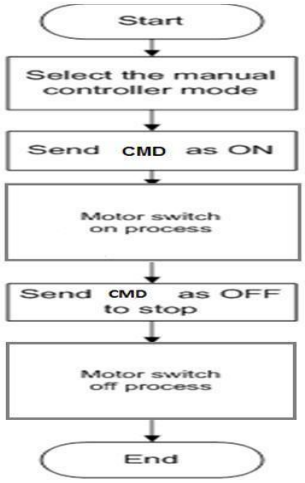

Fig 4: Flow chart of Manual Mode

7. RESULTS AND DISCUSSION

Fig 5: Second Screen with three options for a user to select.

Fig 6: Hardware part for controlling the user selected modes

Discussion: Fig: 5 & 6 are the result oriented where initially user need to enter the user name as "android" anda password as "android" then need to press a submit button. Once the submit button pressed another layout will open that is Fig 6. User need to choose the mode of operation among three respectively. If user press the Humidity Mode the sms will sent to the GSM model where in that the sim is inserted it receives the command then the command will send to microcontroller through RS232 where in the micro controller port 1 will set connected to the sensor where it sense the moisture atmospheric if the moisture is greater than the threshold the motor get start automatically where it controlled by microcontroller port 0 and the message will received to user as motor is ON. Else if moisture is less than threshold the motor will in off state.

If user press manual button than another layout open where there is provided ON and OFF buttons. If user press ON button the command will set to GSM than to microcontroller through RS232 than motor is get ON and the message is received to user as motor is ON if user forgot to off it after 15min the motor get off automatically. If user presses OFF button the motor get off by giving acknowledgement as PUMP IS STOP

The following table shows the assumptions of input and output terms:

Atmospheric Temperature (.c)	Soil Temperature (.c)	Soil moisture Content (%)	Motor Status
20	19	65	OFF
31	30	19	ON
30	29	27	ON
23	20	54	OFF
31	30	6	ON
29	28	12	ON

CONCLUSION

Since earlier days farmer is supposed to visit their agricultural land and check the moisture content of soil manually. It will take minimum human efforts this technology can be used. It allows the user can monitor and maintain the moisture remotely irrespective of time. It is really an effective and economic way to reduce human effort and water wastages. Current techniques in agriculture have reduced the ground-water level and improve the crop production. This Irrigation control system using Android mobile can help farmer in many ways to know the Humidity, Automatic and Manual modes of operation. This system not only in agricultural fields, this system also can be used in Cricket stadiums or Golf stadiums and also in public gardens. This system has a huge demand and scope in crop production. It allows a lot of development within it and leads to the standard and useful system which can be used vary widely in agricultural field for betterment of crop production.

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