Irrigation Control System Using Android and GSM for Efficient Use of Water and Power

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Abstract- The motivation for this project came from the countries where economy is based on agriculture and the climatic conditions lead to lack of rains & scarcity of water. The farmers working in the farm lands are solely dependent on the rains and bore wells for irrigation of the land. Even if the farmland has a water-pump, manual intervention by farmers is required to turn the pump ON/OFF whenever needed. In this paper we tried to minimize this manual intervention by the farmer. In recent times, the farmers have been using irrigation technique through the manual control in which the farmers irrigate the land at regular intervals by turning the water-pump ON/OFF when required. This process sometimes consumes more water and sometimes the water supply to the land is delayed due to which the crops dry out. Therefore in this paper we use an Android application which helps the farmer to ON/OFF the motor without his physical presence in the field.

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

I.   INTRODUCTION

The continuous increasing demand of the food requires the rapid improvement in food production technology. In a country like India, where the economy is mainly based on agriculture and the climatic conditions are isotropic, still we are not able to make full use of agricultural resources. The main reason is the lack of rains & scarcity of land reservoir water. 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 very important reason of this is due to unplanned use of water due to which a significant amount of water goes waste. At the present era, the farmers have been using irrigation technique in India through the manual control in which the farmers irrigate the land at the regular intervals. This process sometimes consumes more water or sometimes the water reaches late due to which the crops get dried.

Automated irrigation system uses valves to turn motor 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 labour to turn valves on and off. In addition, farmers using automation equipment are able to reduce runoff from over watering saturated soils, avoid irrigating at the wrong time of day, which will improve crop performance by ensuring adequate water and nutrients when needed. Automatic irrigation is a valuable tool for accurate soil moisture control in highly specialized greenhouse vegetable production and it is a simple, precise method for irrigation. It also helps in time saving, removal of human error in adjusting available soil moisture levels and to maximize their net profits.

II.   METHODOLOGY

A. Existing system

In the existing system farmers have to travel to fields often at odd hours just to switch ON/OFF the motor due to erratic power supply. Existing aids like auto-starters are unreliable and incapable of communicating the operating state of the motor, to the farmer, especially when a farmer has more than one motor pump set; he has to run around to make sure that all the motor pumps are working when the power is available. At times, motor pumps are left running for longer than what is necessary because of the effort involved in switching OFF the motor. This leads to wastage of both electricity and water.

B. Proposed system

To overcome the drawbacks of existing system like high cost, difficult in maintenance and more wired connection, we introduce a new system which will have wireless connection between server and nodes. We introduce a new design of embedded web server making use of GSM network technology in this paper. Compared to the wired link web server system, this system is characterized by having no wires between the web server and terminal nodes. In proposed system the irrigation will take place only when there will be intense requirement of water. Irrigation system uses valves to turn irrigation 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 labor to turn valves on and off.
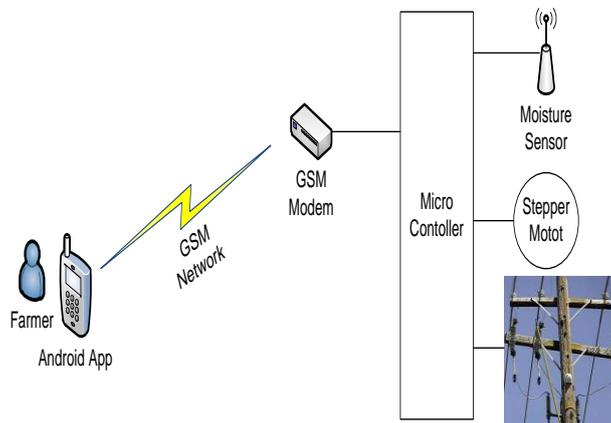
Fig 1: Block Diagram of Microcontroller-based irrigation system

III.   IMPLEMENTATION

Earlier, farmer faced the problem of sending SMS and making calls, overcoming which we are designing an Android application which does the work by button clicks, here the hardware works in three modes of operation viz. Humidity, Automatic and Manual modes. In Humidity mode, the moisture of the atmosphere is sensed and the switching on/off is done if the weather is dry. In Automatic mode, the hardware automatically turns on the motor for the specified time interval and turns off the motor. In Manual mode, user can turn on and off by pressing the ON/OFF button. All the settings of these features is done via an Android application.

Here we have designed a module using a microcontroller and GSM. Initially farmer needs to check the network by giving a ring to the particular modem number which is implemented near the motor. A user enters the username and password given, which when matches allows the user to switch between the different modes provided. If the password fails to match, no action is taken. In every stage it will send the status to the farmer (authenticated user).i.e., whether the motor is on or off through an SMS. If the motor is on and the farmer needs to switch off he just needs to send an SMS to the same number. The complete operation can be handled by sending an SMS, i.e. by sending ON motor gets on, and by sending OFF motor gets off.

We have three modes of operation. In Humidity mode, the humidity sensor checks the moisture content in the farm and accordingly provides the water required for the crops. In Automatic mode, the timer is set and the motor turns ON/OFF automatically for a certain amount of time. In Manual mode, the farmer has to press ON/OFF for the working of the motor.

IV.   MODES OF OPERATION

A. Humidity Settings Manager

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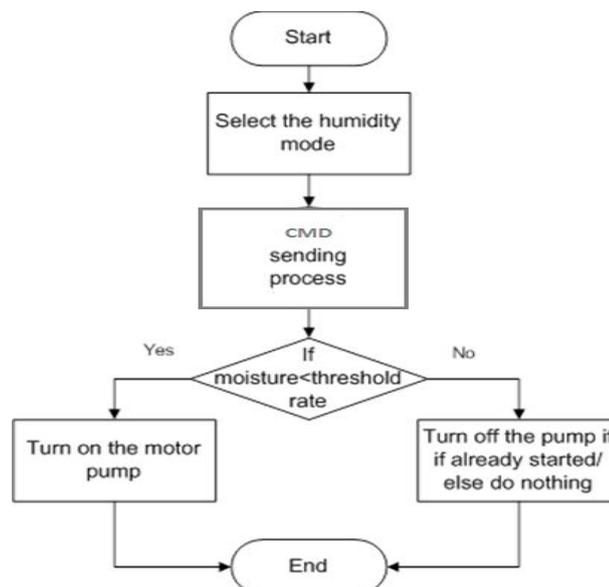

Fig 2: Flow Chart of Humidity Mode

B. Automatic Motor Controller:

This module is used to control the pump automatically. The pump will be turned on automatically every day at a particular time for 2 minutes, immediately after 2 minutes the pump will turns off. The turning on and off of the pump will work regardless of the moisture rate around the field area. This automatic mode can be set by sending an SMS containing SET2 to the GSM modem in the embedded system connected to the pump.
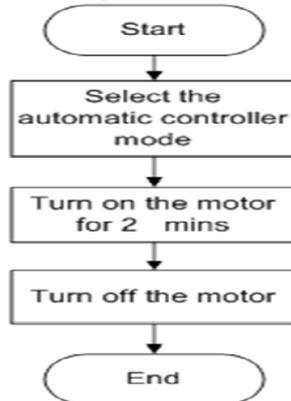
Fig 3: Flow chart of Automatic Mode

C. Manual Controller Manager

This module is used to control the water pump manually, though without farmer's physical presence. We can turn on/off the pump when we require it to. There is no particular time to switch it on or there is no time limit when to turn it off. This 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 connected to the pump.
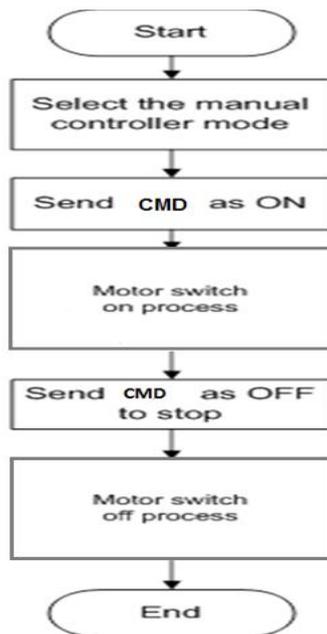
Fig 4: Flow chart of Manual Mode

V.   RESULTS AND DISCUSSION

Fig 5: Welcome screen for the user to enter username and password to log into the application.

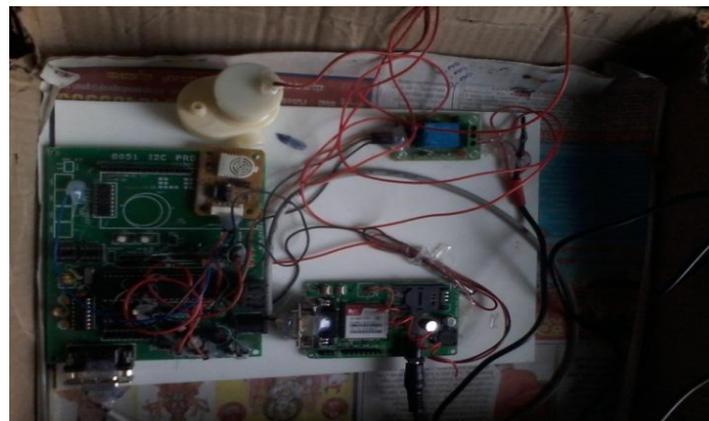Fig 6: Second Screen with three options for a user to select.

Fig 7: Hardware part for controlling the user selected modes

Discussion: Fig. number 5,6 & 7 are the result oriented where initially user need to enter the user name as "android" and a password as "android" then need to press a submit button. Once the submit button pressed another layout will open that is Fig 6. Where user need to choose the mode of operation among three recpectively. 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 he 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 press OFF button the motor get off by giving acknowledgement as PUMP IS STOP

VI. CONCLUSION

Since earlier days farmer is supposed to visit their agricultural land and check the moisture content of soil manually. To avoid more human efforts this technology can be used. It allows the user to monitor and maintain the moisture remotely irrespective of time. It is really an effective and economic way to reduce human effort and water wastage in agriculture land. Current techniques in agriculture have reduced the ground-water level and availability of human resource. This Irrigation control system using Android can help farmer in many ways through the use of Humidity, Automatic and Manual modes of operation. Apart from agricultural fields, this system can be used in Cricket stadiums or Golf stadiums and also in public gardens. The system has a huge demand and future scope too. 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.

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