

Optimizing Crop Irrigation Through RF Enabled Centralized Controlling Station

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Abstract: Irrigation science in any developing nation like India has been always a rough estimate which is based on experience or some empirical formulas. This paper envisages this critical need and propose a system based on transmitting the soil moisture data from the farmer's field to a centralized located control station this station is supposed to have the required optimum data of soil moisture for that particular crops which the farmer have cultivated in his field. The control station will then make a fair judgment based on the soil moisture data and the optimum moisture data also considering the field area of cultivation to what extend the field needs to be irrigated. The auto controlling can be either in the form of operating a valve, motor or a channel gate. It is also suggested that if in case of remote control of motor is not possible, a suggestive optimum watering plan may be given to a farmer so he may himself do the manual irrigation using conventional techniques.

Keywords: Microcontroller, AT89s52, RF module, LM393 soil moisture sensor.

I. INTRODUCTION

In a country like India, agriculture plays an important role in the economy and development of the country. In the current era, the farmers have been using irrigation practice using manual control in which they irrigate the land at some estimated intervals. The process sometimes leads to overwatering or scarcity which in turn affects the quantity or quality of yield. The proposed control system promises to optimize field yield and also taking care of less human resources which is getting costly [1].

In the proposed design a automated system which is used to measures the moisture of agricultural soils by real-time method and minimize the manual involvement of the farmer, The system uses a micro-controller and RF module. The sensor senses the amount of moisture present in the soil and signal is remotely transmitted to the centralized control station.

II. BASIC PRINCIPLE OF IRRIGATION CONTROL SYSTEM

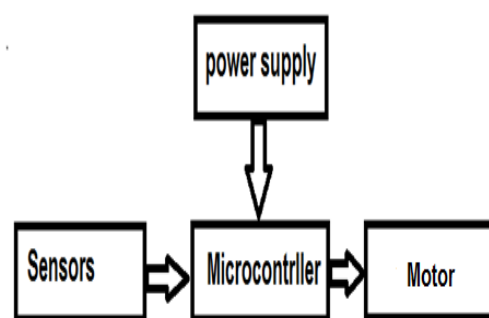


Fig.1 Irrigation control system

To optimize crop irrigation automatically the basic block diagram shown in fig 1. The sensor like soil moisture LM393 senses [5, 6] the moisture parameter and converts it into electrical voltage which is fed to the microcontroller for further processing. The microcontroller is programmed for automatic controlling of valve & motors. It will compare the sensed parameter with a references parameter already stored in microcontroller and give the signal to the solenoid valve and motors by which solenoid valve activates.

The area which is to be irrigated is divided into a of discrete zones of possible different soil conditions, where each zone includes at least one sprinkler head, or other water dispensing device and a solenoid valve having an "on" state and an "off" state for controlling the flow of water to such device for that zone and which comprises a moisture sensor disposed in the soil in each of the zones. The controlling of valves, depend on an electrical signal proportional to the level of moisture in the particular zone sense by sensor.[2]

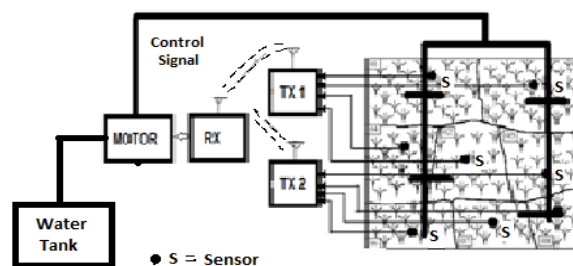


Fig.2 Basic architecture of irrigation system using RF module

A microcontroller is coupled in controlling relationship to the solenoid valves in each of the zones and is effective to periodically transmit the interrogation signals to each of the moisture sensors. The moisture sensors then respond by transmitting the predetermined electrical signal to the microcontroller. The microcontroller includes circuitry and software for selectively actuating the solenoid valves in the zones to an "on" state at predetermined times. [2,4,5,6]

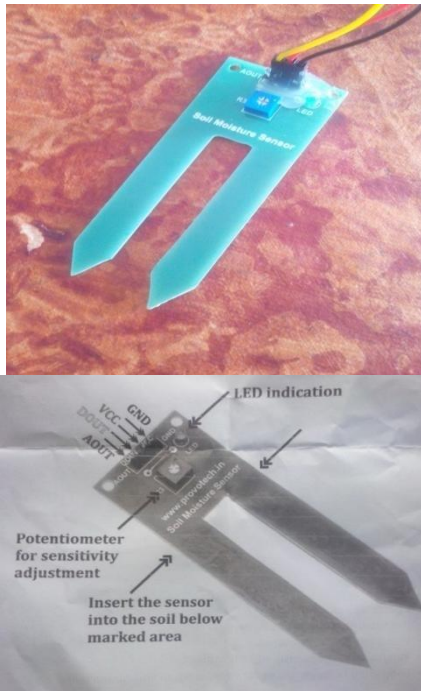


Fig.3 LM393 soil moisture

III. SYSTEM ARCHITECTURE

The soil moisture sensor is inserted into the soil, the moisture sensor senses the moisture level of the plant or a soil. In this mainly two conditions are applicable either the soil moisture of soil is less or field is dry then the soil sensor give low voltage output at the output terminal and when the moisture of the soil is higher or field is wet then the soil sensor give the high voltage output at the output terminal

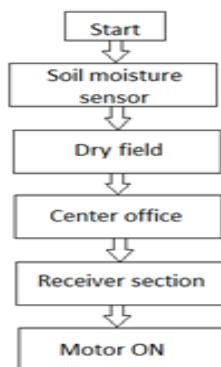


Fig.4 Dry condition

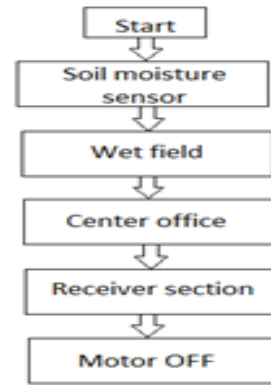


Fig. 5 Wet condition

For the both condition the sensor sense the soil moisture and transmitted the signal by the help of RF module. [7,] In RF module we use transmitting antenna and second is receiving antenna. The transmitting antenna transmitted the signal over to air. The RF module.[7] is appearing at low cost for wireless communication. We use RF module which content 434MHz it cover the range around the 90meter to 100meter the transmitting antenna transmitted the signal to the central located control station which is suppose to have the required optimum data of soil moisture that particular crops which the farmer have so the centralized control station processing on the receiving data and transmitted this data to the receiver section then receiver section is at near of the water source or motor. The receiver receive the signal and start the motor to derive "on" when the condition is applied another motor is "off" when the condition is wet. [7] This system is based on radio frequency (RF). The microcontroller AT89s52.[3,4] is a computer on single chip. The microcontroller is same as microprocessor but in the microcontroller have many in build component like RAM, ROM, input/output ports, timer, counter and serial port it is easy to develop products like the availability of an assembler, debugger, compiler and technical support. Thus the microcontroller AT89s52, [4, 3] satisfying the criterion necessary for the proposed application is chosen for the task.

IV. CONCLUSION

The proposed system promises the enhanced productivity at optimum water consumption. The RF transmission of control signals eliminates the need of laying cables in the field. This investigation if clubbed together with the finding of various research papers in the field of agriculture then the control station can take better decision for the optimum need of water.

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