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Sensor Based Water Pumping for Agriculture Field

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Abstract :- Now days, there are various problems of uncertainty of rain. Due to this the farmer are facing many problems during the productivity of different crop cultivation and cultivating field. Thus the prices of various items are rising with high level in the market day by day. To solve this problem detecting soil moisture is important. In this paper we proposed a method which is used to detect soil moisture and based on that pumping motor will automatically pumps the water into the field and accordingly pumping motor will automatically on or off based on the value of soil moisture.

Keywords: - Soil moisture, moisture detecting sensor, agriculture field.

I. INTRODUCTION

Irrigation farming is the way to grow crops with the help of irrigation systems by supplying water to land through rivers, reservoirs, tanks, and wells. Over the last century, the population of India has tripled. With a growing population and increasing demand for food, the necessity of water for agricultural productivity is crucial. India faces the daunting task of increasing its food production by over 50 percent in the next two decades, and reaching towards the goal of sustainable agriculture requires a crucial role of water. Empirical evidence suggests that the increase in agricultural production in India is mostly due to irrigation; close to three fifths of India's grain harvest comes from irrigated land. The main strategy for these irrigation systems focuses on public investments in surface systems, such as large dams, long canals, and other large-scale works that require large amounts of capital.

Frequent shifting from one land to the other has affected the ecology of these regions. The area under natural forest has declined; the fragmentation of habitat, local disappearance of native species and invasion by exotic weeds and other plants are some of the other ecological consequences of shifting agriculture. In a commercial based agriculture, crops are raised in large scale plantations or estates and shipped off to other countries for money. These systems are common in sparsely populated areas such as Gujarat, Punjab, Haryana, and Maharashtra. Wheat, cotton, sugarcane, and corn are all examples of crops grown commercial.

Agriculture is major source of food production to the growing demand of human population. In agriculture, irrigation is an essential process that influences crop production. Generally farmers visit their agriculture fields periodically to check soil moisture level and based on requirement water is pumped by motors to irrigate respective fields. Farmer need to wait for certain period before switching off motor so that water is allowed to flow in sufficient quantity in respective fields. This irrigation method takes lot of time and effort particularly when a farmer need to irrigate multiple agriculture fields distributed in different geographical areas. Traditionally farmers will present in their fields to do irrigation process. But nowadays farmers need to manage their agriculture activity along with other occupations. Automation in irrigation system makes farmers work much easier. Sensor based automated irrigation system provides promising solution to farmers where presence of farmer in field is not mandatory to perform irrigation process. Automated systems are electromechanically programmed for controlling mechanical devices like water pumping motor, water pipe valves, etc based on the feedback of sensor node placed in irrigation field.

In the field of agriculture, use of proper method of irrigation is important and it is well known that irrigation by drip is very economical and efficient. In the conventional drip irrigation system, the farmer has to keep watch on irrigation timetable, which is different for different crops. Our implementation makes the irrigation automated. With the use of low cost sensors and the simple circuitry makes it a low cost product,

which can be bought even by a poor farmer. This implementation is best suited for places where water is scares and has to be used in limited quantity. In this system checks the moisture content in the soil, based on that pumping motor will automatically pumps the water into the field. By using soil moisture sensor, find whether the soil is wet or dry. If it is dry, pumping motor will pump the water. The main controlling device is microcontroller. soil sensor will give the status of the soil to the microcontroller, based on that microcontroller will display the status of the soil on the LCD and switch on or off the pumping motor through relay.

The pumping motor will pump the water into the field by using drip water system until the field is wet which is continuously monitor by the microcontroller. In irrigation process, most parameter of monitoring is soil, so it is important to monitor the soil condition, whether the soil is dry or wet. If it is dry, then by using pumping motor, water has to be pumped automatically. The main aim is to monitor the moisture content in the soil in cultivating field. This saves the water at the same time the plant can get optimum level of water, so increasing productivity of crop.

II. LITERATURE SURVEY

In this section we present a detailed study on sensor based automated irrigation systems. Constantinos et al [1] implemented a smart garden irrigation system using WSN. Author s abstract a regular home garden with three pots containing different plants with highly diverse watering needs. Soil humidity of the pot is monitored by sensor mote equipped with soil humidity sensor. Watering of the pot is controlled by mote driven electrovalve. When the pot soil is too dry the sensor mote drives the electro valve to start watering the pot. When the soil humidity returns to normal level the mote signals electro valve to cut off water supply for that pot. Similarly Raul Morais et al [2] implemented a smart wireless sensor network irrigation System.The system uses LM50B temperature sensor, hybridCap relative humidity sensor, TSL230 solar radiation sensor, and dual probe heat capacity sensor for motoring irrigation field.Also Ragheid Atta et al [3] implemented a smart irrigation system for wheat cultivation in saudi arabia using wireless sensors network. The system performs well in maintaining the normal growth of plants while saving the amount of water used by around 25%.Tahar Boutraa et al[4]evaluated the effectiveness of automated irrigation system over manual irrigation system. The evaluation parameters are shoot, root,total fresh weight and dry weight of wheat crop. Both manual and automatically irrigated plants show no major difference in shoot growth and total fresh weight.However root growth and total dry weights are higher in automatically irrigated plants than those manually irrigated.Photosynthesis is the process by which plants make their food. The rates of photosynthesis were determined in both manually and automatically irrigated plants. The results showed that photosynthesis rates declined earlier in manually irrigated plants. Manish Giri and Dnyaneshwar [5] proposed automated drip irrigation system using linear programming. Linear programming approach properly use available water resource to irrigate the field effectively in such a way to get maximum profit with lower cost. Sukhjit Singh and Neha Sharma [6] applied fuzzy algorithm in wireless sensor drip irrigation technique to control wastage of water. Compared to Nuppy algorithm, the fuzzy algorithm produces better average end to end delay and reliable water level information. Muhammad Umair and Usman [7] present artificial neural network (ANN) system for irrigation scheduling. ANN controller is compared with ON/OFF controller and the results shown that ON/OFF controller based system fails miserably because of its limitations. On the other hand ANN controller has inherent ability to adapt to the changing conditions unlike conventional methods.

III. METHODOLOGY

Atomizing the agricultural system is very useful for old people and normal persons who lives far away from the agricultural field. If installed and programmed properly, automatic agricultural systems can even save money and help in water conservation. Here LCD and GSM receive the information about temperature, humidity and conditions of the soil and motor. Soil moisture sensor sense the condition of the soil whether it is dry or wet and sends the information to microcontroller.

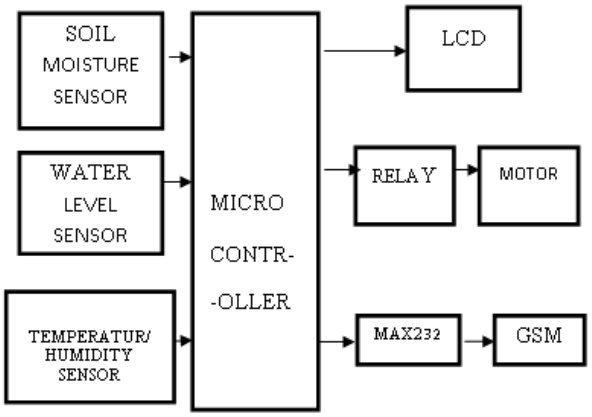

Fig.1: Block diagram of Set-up.

Water level sensor senses the water level in the water source and sends the information to the microcontroller. Microcontroller sends the information to the relay then on/off of the motor is done. Temperature and humidity sensor also sense the condition of the weather and sends the information to microcontroller. There is a serial communication between microcontroller and GSM. So the information from the microcontroller is sent as SMS through GSM .LCD displays & GSM receives the information about temperature, humidity and conditions of the soil and motor our project aims to implement the basic application of Modernization the irrigation field by programming the components and building the necessary hardware**.** The following components are used

GSM Modem

A GSM Modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. from the mobile operator perspective, a GSM modem looks just like a mobile phone.

Soil Moisture Sensor

The heart of the sensor module is the Microcontroller to which the soil moisture sensor, temperature sensor and wind sensor modules are interfaced. That the system will checks the moisture content in the soil, based on that pumping motor will automatically pumps the water into the field.

Microcontroller ATmega16

ATmega16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing, Know more about

RISC and CISC Architecture) architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum frequency of 16MHz.

LCD Module

Liquid-crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images, such as preset words, digits, and 7-segment displays as in a digital clock.

IV IMPLEMENTATION

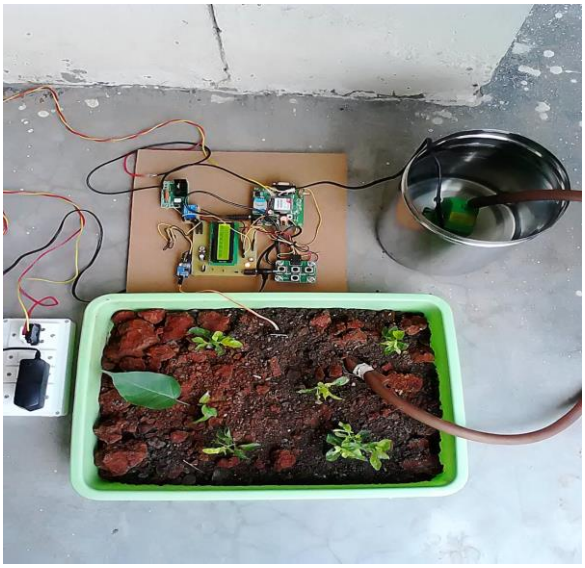

Fig.2: Experimental Set-Up

In above setup, three components are shown.
Soil sensor with sensor
GSM kit
Water Pumping Motor
Threshold Kit
Fig.2 shows the pot containing soil with different moisture level as irrigation fields. Soil moisture in each field is measured by a sensor node equipped with a soil moisture sensor. Two probes of soil moisture sensor are inserted into soil to measure soil moisture in the field.
GSM Modem with a simple to implement RS232, TTL Serial Use it to send SMS, make and receive calls, and do other GSM operations by simple AT commands through a serial interface from microcontrollers and computers. It uses the highly popular SIM900A module for all its GSM operations. It comes with a standard

RS232 interface which can be used to easily interface the modem to microcontrollers and computers. The modem also features a serial TTL interface option. Water pumps move water that does not contain suspended solids or particulates. These pumps are not so much a type of pump as they are a classification based on the media being transferred. Nearly every pump type that is defined by either a complementary application (fountain water pumps, submersible water pumps) or by motive type (such as centrifugal, cantilever, or hand water pumps) can be used in water service applications.

A Threshold kit keypad with 16 keys is used for controlling the system. Keypad is used for entering passwords, setting the mode of operation, requesting sensor data and switching on/off motor. Keypad is a set of buttons arranged in a block or "pad" which usually bear digits, symbols and usually a complete set of alphabetical letters. If it mostly contains numbers then it can also be called a numeric keypad. Keypads are found on many alphanumeric keyboards and on other devices such as calculators, push-button telephones, combination locks, and digital door locks, which require mainly numeric input.

In this implementation, system checks the moisture content in the soil, based on that pumping motor will automatically pumps the water into the field. By using soil moisture sensor, find whether the soil is wet or dry. If it is dry, pumping motor will pump the water. The main controlling device is microcontroller. Soil sensor will give the status of the soil to the microcontroller, based on that microcontroller will display the status of the soil on the LCD and switch on or off the pumping motor through relay. The pumping motor will pump the water into the field by using drip water system until the field is wet which is continuously monitor by the microcontroller. In irrigation process, most parameter of monitoring is soil, so it is important to monitor the soil condition, whether the soil is dry or wet. If it is dry, then by using pumping motor, water has to be pumped automatically. The main aim is to monitor the moisture content in the soil in cultivating field. This saves the water at the same time the plant can get optimum level of water, so increasing productivity of crop.

V. CONCLUSION

In this paper a prototype for automatic controlling and remote accessing of irrigation motor is explained. Prototype includes sensor node, controller node and mobile phone. The sensor node is deployed in irrigation field for sensing soil moisture value and the sensed data is sent to controller node and accordingly pump automatic start. Prototype is experimented with pot containing soil with different moisture level as irrigation fields. The experimental results show that the prototype is capable for automatic controlling and remote accessing of irrigation motor based on the feedback of soil moisture sensor. The prototype can facilitate farmer in monitoring and controlling irrigation activity from remote location.

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