Automated Irrigation Control System

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***Abstract* - Irrigation is the artificial supply of water to the land or soil. In India agriculture is the major source of earning and it has made a big impact on Indian economy. This paper focuses on a smart irrigation system which is cost effective and which is affordable by middle class farmers. These days automation plays a very important role in human's life. At present industries use automation and control machine which is of high cost and not suitable for using in a farm field. The main objective of this paper is to control the flow of water automatically and to select the direction of water flow in pipe with the help of soil moisture sensor. Finally we need to send the information of the farm field to the user's Gmail account or to the mobile message. It provides comfort to user and also reduces energy, efficiency and save time.**

Keywords— Soil moisture sensor, Electromagnetic valve, Arduino, Raspberry-Pi, Modem, Display, Wireless Sensor Network (WSN) Introduction (HEADING 1)

I. INTRODUCTION

Agriculture is major source of food production in our country to the growing demand of human population. Irrigation is an essential process that influences crop production in agriculture. Generally farmers will be visiting their farms to check the moisture content level of the soil and accordingly based on its requirement water is pumped by motors to irrigate respective fields. The farmers need to wait for a certain period of time to switch off motor so that water is allowed to flow in sufficient quantity in respective fields. This traditional irrigation system takes lot of time and effort particularly when a farmer need to irrigate multiple agriculture fields located in different areas. In this irrigation method farmers will present in their fields to do irrigation process. But nowadays farmers can manage their agricultural activity along with other occupations. Automated irrigation system makes farmer work much easier. Sensor based automated irrigation system provides promising solution to farmers where farmers need not be present in the field compulsorily. At present internet is widely used. Using internet farmer can get the status of agriculture field irrigation, which will help farmers to know the status of farm field watering direction through a message whether the farmer is far away from field know the status of water motor is ON or OFF and direction of watering.

This paper presents a prototype for fully automation accessing of irrigation motor where Prototype includes number of sensor node placed in various directions of farm field. Every Sensor is integrated with a wireless networking device and the data is collected by the "ATMEGA-328" microcontroller which is on an "ARDUINO-UNO" development board. The RASPBERRY-Pi is used for sending messages through internet which is correspondence to the microcontroller process. For the purpose of experimentation we need number of soil moisture sensor used in different direction of the farm fields. The soil moisture is sensed by sensor node and the sensed data is sent to the microcontroller node through wireless networking device. On receiving sensor value the controller node checks it with threshold value. When moisture level in a particular field is not up to required threshold level then controller node will switch on the motor to irrigate associated field and the RASPBERRY-Pi processes all data and notification SMS is sent to the registered mobile phone which is registered in RASPBERRY-Pi.

II. IRRIGATION IMPORTANCE

The rainfall in our country depends on monsoons. Rainfall controls the agriculture, but agriculture is said to be "the gambling of the monsoon" as the rainfall are uncertain, irregular and uneven or unequal. So irrigation is always essential for agriculture.

In our country 80% of the total annual rainfall occurs in four months, i.e. from mid June to mid October. So it is very important to irrigate farm field during the rest of the eight months [1].Authors and Affiliations.

III. METHODS OF IRRIGATION

There are different methods for irrigating farm field for different types of crop field. Traditionally Indian farmers use these three methods i.e. channel system, sprinkler system and drip system. But smart irrigation system is a new technology to irrigate farm field automatically.

A. Channel System

This system is widely used in irrigation system, because this system is a very low cost system for irrigating a large area farming field. In the channel system pipes are being connected with a water pump where the water pump started the flow of water through pipe from lake, river, and bore well to the farming field. Farmers are fully engaged for irrigating the crop field with the various numbers of workers. This system requires huge amount of water and large number of workers during watering.

Fig 1: Channel System Irrigation

B. Sprinkler System

Sprinkler system is more useful whenever the water is available in smaller quantity. When pump is started, water flows through the main pipe and also through the perpendicular pipes. A nozzle which is on the top of perpendicular pipe is joined and rotated automatically at regular intervals. This system requires less number of workers and also loss of water is reduced [1].

Fig 2: Sprinkler irrigation system

C. Drip System

In drip irrigation system waterfalls drop by drop at the position of the roots. It is one of the best technologies for watering fruit plants, gardens and trees. Water flows through a main pipe which is divided into sub pipes. The nozzles are being attached to these sub pipes. In this system wastage of water is reduced and No worker is needed for irrigating. When farmer will get to know the status of the farm field then will start the motor and chose the direction from nozzles. Later automatically watering the plants and after some time the farmer will check the status of the field and while the whole crop are being irrigated then OFF the motor [1].

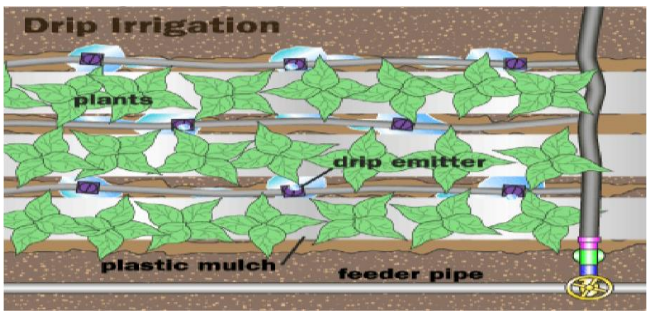

Fig 3: Drip irrigation System

D. Smart Irrigation System

The above three systems are generally operated by a user but a smart irrigation system are automatically controlled which controls the total irrigation system whenever the farmer is not present in the farm field and sends message to the farmers about the status of the farm field and change in operation of the farm field. This system doesn't require any worker for operating, and it requires less water when compared to previous three methods.

Fig 4: Smart Irrigation System

IV. COMPONENTS

A. Soil Moisture Sensor

Soil Moisture Sensor (SMS) is used to measure humidity of the soil. It includes comparator (LM393) which will convert analog data to discrete. Two soil probes contain two thin copper wires each wire is of 5 cm length which can be immersed into the soil under test. This circuit will give a voltage output corresponding to the conductivity of soil. The resistance across soil probes vary from infinity to a very little resistance. It will work on the principle of dielectric permittivity. Dielectric permittivity is a function which measures the amount of water present in the soil.

B. Arduino

Arduino-Uno is a microcontroller board which is based on the ATmega328. It has 6 analog inputs, 14 digital input/output pins, a USB connection, a power jack, 16MHz ceramic resonator, a reset button, and an ICSP header. It receives input in the form of light on the sensor or a finger on a button and processes the output by activating a motor, turning on LED. Arduino-Uno contains everything needed to support the microcontroller; simply we need to connect it to a computer with a USB cable, or else we need to power it with an AC-to-DC adapter or battery to get started [2].

C. Raspberry-pi

The Raspberry Pi is a small, lightweight and powerful ARM based computer which can do many of the things in a better manner which a desktop PC can do [3]. The powerful graphics capabilities and the HDMi video output will make it ideal for multimedia applications such as narrowcasting solutions and media centers. It is based on a Broadcom BCM2835 chip.

D. Electromagnetic valve

Electromagnetic valve is also known as solenoid valve. It is an electromechanical device which uses electric current to generate magnetic field which will regulate the opening of fluid flow in a valve. It is comprised of a coil, core tube, core and enclosure. 3-Way Electromagnetic Valve has two orifices and three pipe connections. When one orifice will be open, the other is closed and vice versa, which is automatically controlled by the water requirement of sensor node.

V. FLOW OF THE PROCESS

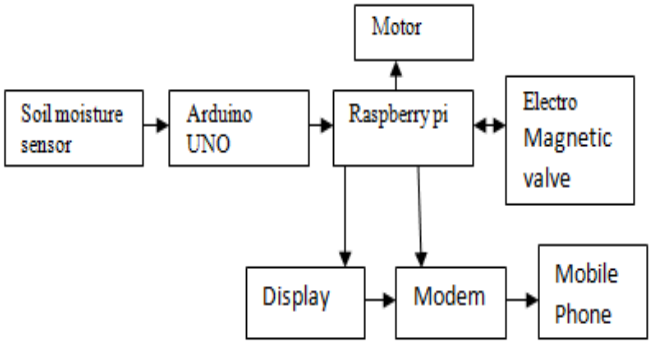

Fig 5: Block Diagram

The above figure contains Soil moisture sensors which is used to measure the moisture level in soil. It will send the data to wireless network device, the data from this network device is sent to Arduino Uno where the microcontroller will process the data and calculates the percentage of dryness. The value of this dryness is fed to the raspberry-pi to operate motor and control the electromagnetic valve. User can get to know the status of the farm field by a message through the registered mobile number.

VI. PROPOSED SYSTEM

The large farm field requires large number of pipes for watering the field in the different directions by the motor, which is controlled by the farmer and it requires more effort from farmer. But by using electromagnetic valve it can automatically change the direction of the water as per required, and the valve is controlled by the Raspberry-Pi. When valve is open the water motor will ON automatically, and sends a message to the registered g-mail account and registered mobile number. By receiving the message farmer can know the status of the farm field while farmer is far away from the field.

In an irregular surface of the field there is a need to use a large number of sensors and wireless networking devices which increases the cost of the smart system. So here our focus is to decrease the number of sensors and wireless network devices. Here the farm field is covered by the set of n sensors distributed randomly. Sensors are placed in every corner of the irregular area and then inside of an irregular surface are designed like square and then sensors are placed in each corner of these squares, which requires less number of sensors. Each sensor node is connected to wireless network devices.

VII. CONCLUSION

Here we have a prototype for controlling an irrigation system automatically, where the prototype includes sensor node and control node. Sensor node is placed in the irrigation field to measure the humidity of the soil; this data is sent to the controller node. On receiving the humidity value of the soil, the controller node checks it with required threshold value. Whenever the humidity of the soil in irrigation field is not up to the required level then the motor is switched on to irrigate agriculture field and alert message is sent to the registered mobile phone of the farmer. The experimental setup shows that the prototype is capable of controlling the agricultural field automatically based on the feedback of soil moisture sensor. By using the automated irrigation system it reduces the usage of water and also reduces the human intervention for farmers. So here the system will be off when the field is wet and the system will be on when the field is dry. This system can be implemented any type of irrigation. It also uses less number of sensors for large area of field which will reduce the cost of the system. Wireless network device reduces the power consumption and the system performs a long time function.

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REFERENCES

[1] International journal of engineering sciences & research technology (IJESRT) survey of smart Irrigation system h.n.kamalaskar* dr. p.h.zope** issn: 2277-9655.

[2] The Arduino Playground (http://playground.arduino.cc/).

[3] RASPBERRY-Pi (http://www.raspberrypi.org/).

[4] Rane, et al .,"Review Paper Based On Automatic Irrigation System Based on RF Module" , 2014.

[5] http://igin.com/article-218-drip-irrigationa-water conserving-solution.html