Implementation of Automatic Wireless Water Conservation in Agriculture

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Abstract— Agriculture plays the major role in economics and survival of people in India. Nowadays climate condition leads to lack of rain and scarcity of water. So that why in our country the supply of quality food is less than actual demand. There is another problem is that existing systems are very complex and operate manually so the requirement of man power is also increased. Because of manual handling wastage of water also increased. The aim of this project is by using ARM and GSM module implementing automatic irrigation system. Purpose of this system is by using embedded based system for irrigation to reduce the wastage of water. This is done by checking soil moisture condition. In this system according to the soil condition valves of water are ON or OFF. If the requirement of water in soil is fulfill then water pump is off as well as valves are OFF. In this system GSM module is used to operate the system from long distance and send the status of system to user. This proposed system helps to reduce wastage of water and increased quality of crops.

Key words: ARM, GSM Module, Valve, Soil Moisture Sensor

I. INTRODUCTION

Nowadays, water shortage is becoming one of the biggest problems in the world. Many different methods are developed for conservation of water. We need water in each and every field. In our day to day life also water is essential. Water is considered to be basic need of human. Water is needed for everyone human beings, animals, plants, etc. Agriculture is one of the fields where water is required in tremendous quantity. Wastage of water major problem in agriculture. Every time excess of water is given to the fields. There are many techniques to save or to control wastage of water from agriculture. In India, where the economy is mainly base on agriculture and climatic conditions are isotropic and are not able to make full use of agricultural resources. The main reason is the lack of rains and scarify 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 irrigated and Another very important reason of this is due to unplanned use of water due to which significant amount of water goes waste.

The development of the automated irrigation system based on microcontrollers (ARM-7) and wireless communication (Using GSM) at rural areas is presented. The aim of the implementation was to demonstrate that the automatic Irrigation can be used to reduce water use.

This gateway permits the automated activation of irrigation when the threshold values of soil moisture are reached. Communication between the sensor nodes and the data receiver is via the GSM Module. a automatic valve controller for site-specific management and/ operation of a automatic integrated irrigation control system is easier to install and maintain as compared to cable irrigation control. As a result, a potential solution to these problems is a total automation of irrigation control system. Automatic irrigation controllers can be implemented using spatially variable irrigation systems to optimize yields and maximize water use efficiency for fields with variation in water availability due to different soil characteristics or crop water needs.

II. NEED OF AUTOMATIC IRRIGATION

Automatic irrigation systems are convenient, especially for those who travel. If installed and programmed properly, automatic irrigation systems can even save you money and help in water conservation. Dead lawn grass and plants need to be replaced and that can be expensive. But the savings from automatic irrigation systems can go beyond that. Automatic irrigation systems can be programmed to discharge more precise amounts of water in a targeted area, which promotes water conservation. To do this we use GSM module for long distance communication, ARM-7 processor to control the all data and main device is soil moisture sensor to measure the moisture of soil.

III. SYSTEM DEVELOPMENT

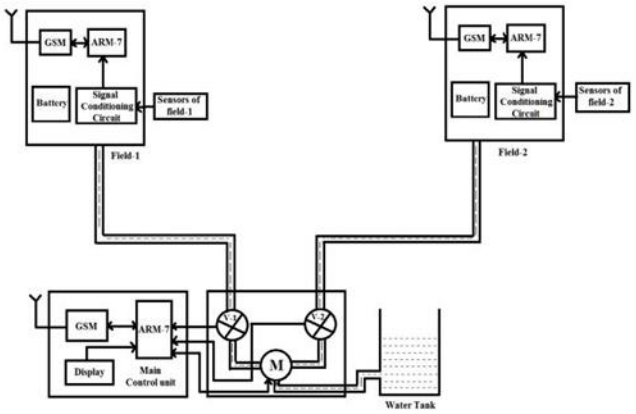

Fig. 1: Block Diagram

A. Working

There are two different unit in this system first is main control unit and second is field control units. The field control unit is place in two different plants. In this unit soil moisture sensors, ARM processor and GSM module is used. All the electronics devices, sensors and module where selected low power and low cost requirement for system. In field control unit sensors are initially in wet condition after starting system. It checks the condition of soil moisture and sends the signal to ARM processor. Processor process on this signal and send signal through GSM module to main control unit.

In main control unit it consist of GSM module, ARM processor, relay unit, solenoid valve and motor. In this unit GSM receive the message signal and send to ARM processor. ARM processor process on received message signal. If the receive signal is one (wet condition) then motor is OFF and valve of respected field is OFF or if it receive zero message signal (Dry condition) then motor is ON and valve of respected field is ON.

The signal which is send by field control unit this signal is also send through message signal to users mobile phone at main control unit received signal from field one and field two simultaneously.

B. Soil Moisture Sensor

Measuring soil moisture is very important in agriculture to help farmer for managing the water level irrigation system. Soil moisture sensor is one of the device which solves this problem. This sensor measures the content of water in field or plants. Soil moisture sensor uses the resistance to measure the moisture of soil. This is a digital sensor which complete the loop when there is moisture is present then it compare the input voltage to reference voltage if input voltage is greater than reference voltage then output value is 1 if it less then output value is 0. This sensor is easy to use.

C. ARM-7(LPC2148) Controller

ARM-7(LPC2148) is used widely from ARM-7 family and this microcontroller socket is used with LPC2148 program Development Board. It is standalone board. It is manufactured by Phillips and is preloaded with many inbuilt peripheral making it more efficient reliable option for the beginner as well as high end application developer. It has 12MHz crystal for clock system and 32 KHz crystal for RTC. In this microcontroller the power consumption is low as compare to other microcontroller. It has power on reset circuit this board used for LPC2148 based generic development.

D. GSM Module (SIM 900)

GSM modem is wireless modem which transfer data between mobile and ARM-7(LPC2148) controller. A GSM modem requires a subscriber identity module (SIM) card to operate. SIM900 is designed for global market and SIM300A is specifically for India. SIM900 is a Tri-band GSM/GPRS engine that works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS1900MHz.

The transmission power in the handset is limited to a maximum of 2 watts in GSM 850/900. SIM390 provides GPRS multi-slot class 10 capabilities. SIM900 has built in RS232 level convertor. It is 40mm x 433mm x 2.85 mm in dimension.

E. Solenoid Valve

According to the condition of soil moisture ARM controller Operated valve-1 or valve-2 and make it ON/OFF. ARM-7 controller also control the main water pump. If pump is ON then and valves are ON if pump is OFF then valves are also OFF. Due to this method we can reduce the wastage of water.

1) Algorithm

1) Start (power supply on).
2) Sensor detects soil moisture conditions and send signal to processor.
3) Processor sends the message signal through GSM module to main control unit.
4) Main control unit receiver the signal through GSM module.
5) ARM processor make motor and valves ON/OFF according to received message signal.
6) Receive message signal is also send to user mobile phone.
7) Users decide system is operated automatically or manually.
8) According to plant soil condition sensor send return signal to main control unit and user.
9) Main motor OFF
10) Stop.

2) Flowchart

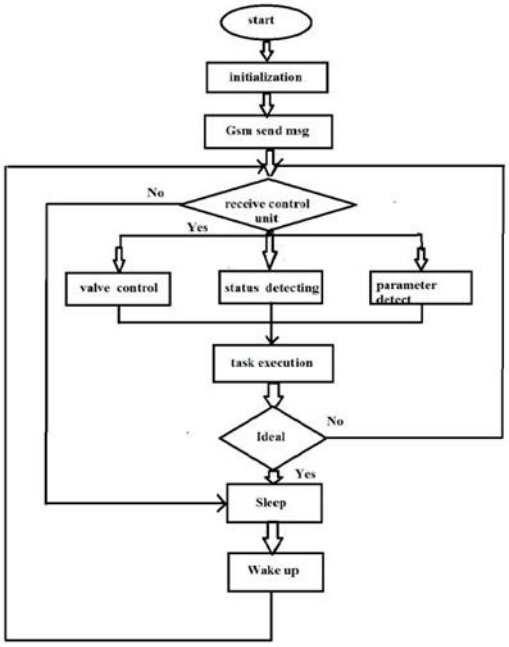

Fig. 2: Flowchart

IV. FUTURE SCOPE

In future we can use more than one plant using single micro controller. We can also use Raspberry Pi module to communicate short distance field. Through HTML we can monitor the parameter of plants. We can also add extra sensor like temperature sensor, water level indicator sensor, Humidity sensor. We can control all irrigation system by using the Wi-Fi module and also by using the GPS module to find the location where we allocate this system and control at home or anywhere.

V. CONCLUSION

Using this system we can control more than one plants or farms at a time. This system is very efficient to use in our day to day life than the other irrigation systems. This system is able to provide an information of moisture level of soil in the plant. We can operate this system from long distance and get the information of plants from long distance. It also capable to provides the information of plants which is placed at any long distance. Using this system we can reduce the wastage of water. This system is very reliable to user which handle this system very easily.

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