

SMART IRRIGATION SYSTEM USING MICRO CONTROLLER AND ZIGBEE

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Abstract

Now a days water crisis is major problem around the world. It affects nearly 70 percent of world population. There is no country which is more rich or poor in water resources. It depends on water management policy of that country. So far, even after seven decades of independence India does not have proper water management policy. This is the reason behind water crisis in our county. Being second highly populated country in the world and entirely depends on agricultural system, which is in turn slave of monsoon. Though after Green revolution, we capable of self- sufficient in production of food, but the current rate of growth will be almost insufficient in next few decades. Hence this paper presents requirement of modernization of agricultural system to very ground level. The present automated irrigation system includes these objectives. It is aimed to lower the burden of the farmers as well as cost of water supply in lands. The model presented in this article includes control of water supply through microcontroller via ZigBee and solenoid valve. It also sends information about moisture level and chemical constituents of soil via GSM using short message service. This enhances modern way of agriculture system. It is very helpful for countries where economy is driven by agriculture system.

Keywords: - Smart Irrigation, Microcontroller, Wireless Sensor Based Probe, ZigBee, GSM

1. INTRODUCTION

There is a rapid demand and more expectation of food from vast market and population. Especially in countries like India, where agrarian system depends on climatic condition. Still we are not able to exploit all the agriculture resources, which results in lack of food supply to lower strata of society. Rapid decrease in underground water level is another huge problem before mankind. Unplanned use of water due to which a significant amount of water goes to waste, even if we use traditional drip/sprinkler irrigation system. The technology gives the best solution to above severe situations but the used technology should be in favour of unspecialized common peasant. In this paper we aimed to make technology based irrigation system as a regular part of the cropping process [1].

Now a day's technology has become integral part of everyone's life. If we provide a direction to the present technology, we can do so many works in most efficient way. Agriculture requires freshwater, which is less on the Earth. To overcome this problem drip irrigation system being introduced. But the present study introducing microcontroller based smart irrigation system (SIS) using wireless sensor network. Different crop methods are used for different crops and according to it water supply is regulated. The wide land is under surveillance. This saves the time, water and money. Any peasant has drip irrigation system can make use of this Automatic Plant Irrigation System (APIS). The water supply is regulated according to priority, which is programmed in 16 bit, 8051 microcontroller. The water is supplied throughout the

land at a particular time of the day and duration. This reduces not only cost, water usage but also weed growth. This is best method to replace labor-intensive agrarians system

2. PRINCIPLE

The basic principle of this paper is "sensing of moisture content and chemical constituents of the soil and hence regulating water supply on priority bases". A novel study has been done using wireless sensor probe which also sends information to owner via GSM using short message service.

3. WORKING

The working of model starts with probe which is sensitive to quality of water and its chemical constituents. Each segment has such a probe. If the moisture around it is less than threshold set value it sends data to microcontroller through ZigBee. Now data is analyzed by microcontroller and microcontroller has programmed in such a way that it send data to control flow of water as per given priority. It means while it sends information about chemical constituents and moisture level of soil to registered mobile number with a short message service (SMS) via GSM service. Now water supplied to that segment for particular time and duration as we programmed it. As moisture content increases in soil through similar process the water supply is reduced. This kind of flow is controlled by solenoid valve. And again SMS is sent to registered number until the process repeats.

3.1 Sensor-Probes

The probe used above is moisture and chemical constituent sensitive. If soil moisture is below a threshold value, then this probe sends the information of moisture of soil along with the chemical constituents of soil. The data is controlled through micro controller. The probe is powered by solar panel. The Information given by probe is received by ZigBee and supplied to micro controller. The sensor monitors the quality of water. There are no of sensors which can be used to test water level as well as chemicals in water. This low powered sensor is can also be used to detect the potential risk to public health in real time. Sensor can also be placed under deep root zone. This reduces operational money and efficiency. This is a smart way to manage water. [2]

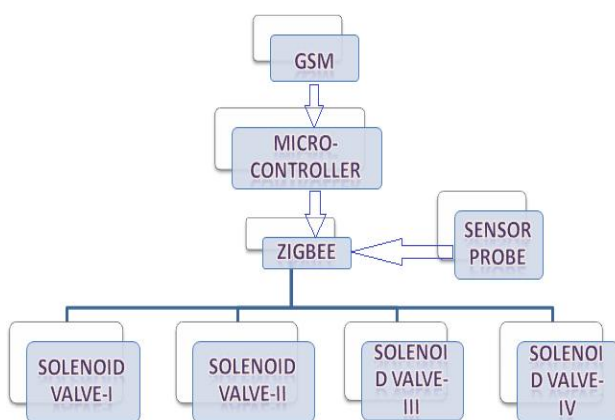


Fig-1: Block diagram of SIS

3.2 Microcontroller

A microcontroller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips. A 16-bit microcontroller with 44-pins and nanowatt XLP Technology that operates in a range 2.0 to 3.6 V at 8 MHz with internal oscillator. It has 25 output /Input ports. 10-bit analog to digital converter (ADC), two. 16-bit timers 64 KB of programmer, memory, 8KB SRAM memory. This microcontroller will suitable for this remote application because of its lower power operating current which is at 175 μ A 2.5 V at 8MHz and 0.5 μ A for stand by current in sleep mode including RTCC.

3.3 GSM

It is very easy to incorporate SMS capability to any pc or embedded controller using serial port or any programming language. GSM model provide a standard API set for communicating with modem and setup to send and receive

SMS to understand and tryout the various AT commands to send an receive SMS so that you can incorporate these in our own software project.

3.4 ZigBee

ZigBee Technology is used for near range area. This sends & receives the information. It is preferred over other because of low cost and lower power usage and good range than other wireless technologies. ZigBee device can be used in many useful areas like Industrial, scientific and medical field and it has 2.4 GHz Radio Band. It can be operated through 1200 to 1400 meter and powered by 3.3 V. It can be used in isolated remote area. The data is transferred in packets; this includes maximum size of 128 bytes. It is not required high data rates. The best thing is, it has point to point topology. It cannot allow other devices to connect, it always transmits & receives data from it parent device. It operates under 64 bit address. These bytes acts as Identifier. [3]

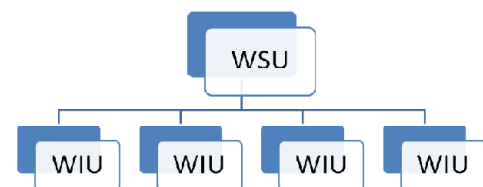


Fig-2: ZigBee working

3.5 Solenoid

Solenoid valve are most frequently used to control flow of fluids. The valve is controlled by an electric current through solenoid. It works under 12 V dc power supply and controlled by micro controller solenoid valve can be used up to 10 bar pressure. Solenoid cock is used to give irrigation water supply according to priority. In drip/sprinkler system the entire field is divided into multiple segments and each segment is further divided into 40 to 50 rows. Now each solenoid valve controls the water supply of each segment on priority wise as per decided by moisture sensor. Solenoid works mechanically on principle of electromagnetism. This valve is connected to flow of water. The body of the valve is cylindrical coil. Which is hollow in structure. [3]

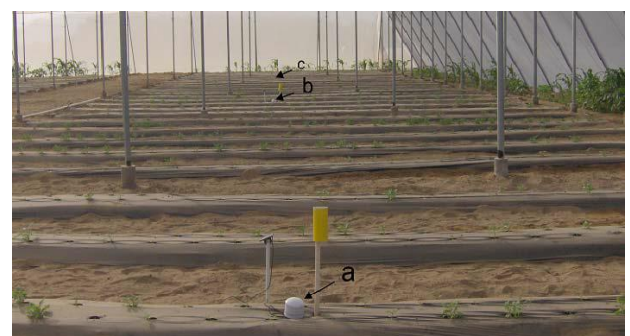


Fig-3: Picture showing solenoid valve in field

4. CONCLUSION

For agricultural production this system was found to be cheaper, effective, and feasible by the limited usage of water. This system not only helpful for people who suffer from water scarcity, it must also ensure the measure of water quality. This type of system is innovative because of priority wise controlled water supply. This enhances the yield and quality of crop. SMS service through GSM service keep updated to farmer without approaching control system. This is helpful to reduce labor cost and managing effort. This can give a good productivity in remote and isolated area. It is a novel study as it is designed farmer friendly and easy to implement

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