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Design and Implementation of Real Time Irrigation System using a Wireless Sensor Network

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Abstract: ***The motivation for this project came from the countries where economy is depends on agriculture and the climatic conditions lead to lack of rains. The farmers working in the farm lands are dependent on the rains and bore wells. Even if the farm land has a water-pump, manual involvement by farmers is required to turn the pump on/off when on earth needed. The purpose 0f this paper to measuring the moisture of agricultural soils by real-time method and to minimize this manual involvement by the farmer, which is why we are using a micro-controller (AVR ATMEGA-16L),RF module. The sensor senses the amount of moisture present in the soil and presents an output in the form of analog voltage ranging between 1.7V (fully saturated condition) to 4.5V (completely dried condition) respectively.***

Keywords: ***water-saving irrigation, WIRELESS SENSOR NODE, WATER RESOURCES, ATMEGA 16L, Soil moisture sensor.***

I. INTRODUCTION

The micro-controller based automated real time Irrigation system will supply the following:

As there is no unexpected usage of water, a lot of water is saved from being wasted.

The irrigation system is use only when there is not sufficient moisture in the soil and the microcontroller decides when should the pump be turned on/off, saves a lot time and water for the farmers.

As there is no unanticipated usage of water, a lot of water is saved from creature wasted. This also gives much wanted rest to the farmers, as they don't have to go and revolve the pump on/off automatically. The constant increasing command of the food provisions requires a rapid improvement in food production technology. In a lot of countries like India where agriculture and the climatic conditions are isotropic, at a standstill we are not able to make full use of agricultural possessions. The main reasons is the not have of rains & insufficiency of land lake water. The continuous removal of water at normal intervals from earth is dropping the water level as a result of which the zones of un-irrigated land are frequently increasing. Also, the unexpected use of water accidentally results in wastage of water.

In an Automated Irrigation System using (AVR ATMEGA-16L), the most significant advantage is that water is supplied only when the moisture in soil goes below a determined threshold value. In current times, the farmers have been using irrigation system through the labor-intensive control in which the farmers irrigate the land at regular intervals by turning the water-pump on/off when essential. These procedures sometimes consume more water and sometimes the water supply to the land is delayed due to which the crops dry off. Water shortage deteriorate plants enlargement before visible wilting occurs. In addition to this slow development rate, lighter mass fruit follows water shortage. This problem can be absolutely rectified if we use Automated Irrigation System in which the irrigation will take place only when there will be strong requirement of water, as optional by the

moisture in the soil. **Irrigation** is the artificial application of water to the soil usually for supporting in rising crops. In crop manufacture it is mostly used in waterless areas and in periods of rainfall shortfalls, but also to protect plants against hoarfrost.

II. AUTOMATED IRRIGATION SYSTEM

There are different types of irrigation system

- Surface irrigation
- Localized irrigation
- Drip Irrigation
- Sprinkler irrigation

The conformist irrigation methods like overhead sprinklers, flood type feeding systems usually wet the lower leaves and stem of the plants. The entire soil surface is soaked and often stays wet long after irrigation is completed. Such condition promotes infections by leaf mold fungi. On the different the drip or trickle irrigation is a type of modern irrigation method that slowly applies less amount of water to part of plant root zone. Water is supplied regularly often daily to preserve constructive soil moisture situation and avoid moisture stress in the plant with proper use of water resources.

Fig 1.1 Drip Irrigation

Drip irrigation save water since only the plant's root zone receives moisture. Little water is lost to deep percolation if the proper amount is applied. Drip irrigation is popular because it can increase yields and decrease both water requirements and manual labor

Drip irrigation requires about partially of the water needed by sprinkler or surface irrigation. Lower operating pressures and flow rates result in reduced energy costs. A higher degree of water control is possible. Plants can be supplied with more specific amounts of water. Disease and insect damage is reduced because plant undergrowth stays dry. Operating price is usually reduced. Federations may carry on during the irrigation The automated irrigation system consists of soil moisture sensors, analog to digital converter, microcontroller, RF CC2500 TX-RX pair, Relay driver, solenoid for control valves.

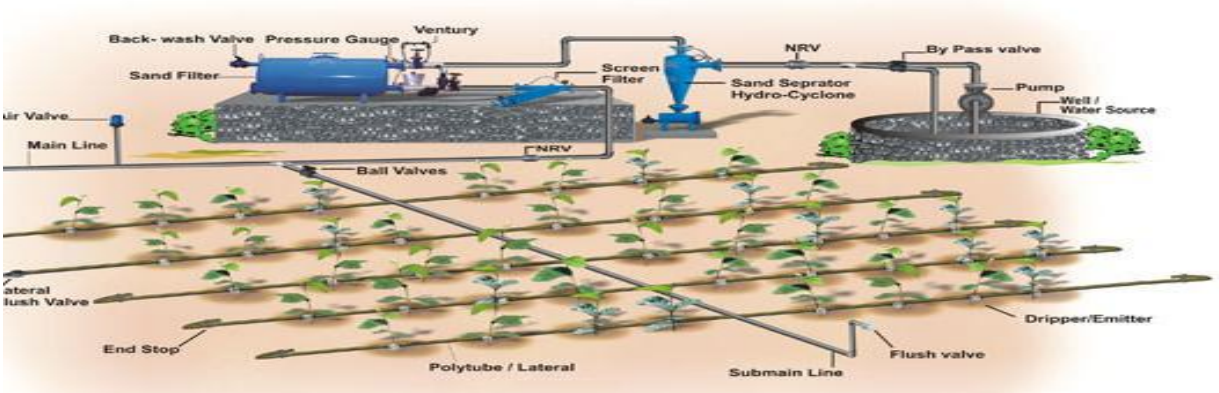

Fig.1.2 DESIGN SCHEME AND SYSTEM STRUCTURE

Design approach of hardware module of Irrigation system Use of AVR Atmega16-L microcontroller which is a low power. The ATmega16 is a low-power CMOS 8-bit microcontroller based on the AVR. By executing superior instructions in a testing clock cycle, the ATmega16 achieves throughputs future 1 MIPS per MHz allowing the system designed to optimize power consumption against processing speed. The AVR central part combine a rich instruction put with 32 general purpose operational registers. All the 32 registers are directly linked to the Arithmetic Logic Unit (ALU), allowing two self-governing registers to be accessed in one single instruction executed in one clock cycle.

The device is artificial using Atmel's high concentration non volatile memory technology. The On chip ISP Flash permit the program memory to be reprogrammed in-system from side to side an SPI serial interface, by a conformist non volatile memory programmer, or by an On-chip Boot program running on the AVR core. By combining an 8-bit RISC CPU with In-System Self-Programmable Flash on a huge chip, the Atmel ATmega16 is a authoritative microcontroller that provides a highly-flexible and gainful solution to many embedded control applications. The ATmega1L AVR is supported with a full set of program and system progress tools counting C compilers, macroassemblers,.program debugger/simulators, in-circuit emulators, and estimate kits.

III. System Design

In the current work we have designed following hardware systems:

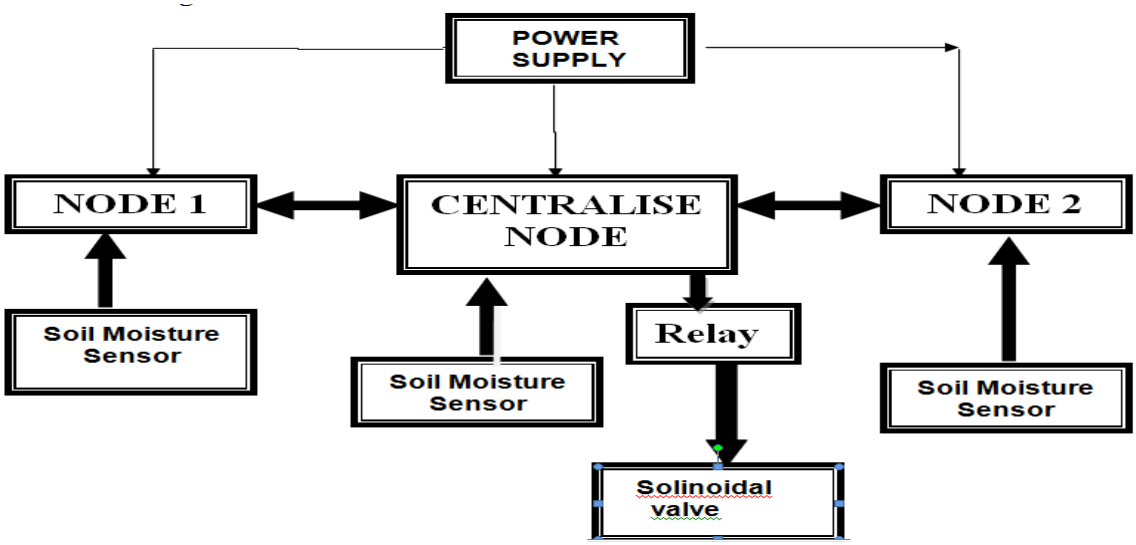

Fig. 1.3 Irrigation systems

A soil moisture sensor are excited by giving suitable power supply of 5V each and is connected to lower four bits of Port A. Port A pins are internally connected to ADC on chip which is of 10 bit resolution. The sensor senses the amount of moisture present in the soil and presents an output in the form of analog voltage ranging between 1.7V (fully saturated condition) to 4.5V (completely dried condition) respectively. The sensor values which are in analog form are converted to digital values and are stored in the ADC data registers ADCL and ADCH respectively. The average of all the sensor values is computed and is used to decide the condition of the relay which controls the valve and thus watering the field for predefined amount of time.

IV. Conclusion

The Microcontroller and soil moisture sensor based irrigation system proves to be a real time response control system which monitors and wheel all the activities of irrigation system. The present system is a model to modernize the agriculture industries at a mass scale with optimum expenditure. In this paper, an automated irrigation model is proposed using different circuits as demonstrated in different figures. We designed and implemented this model considering low cost, reliability, alternate source of electric power and automatic control. As the proposed model is automatically controlled it will help the farmers to properly irrigate their fields. The model always ensures the sufficient level of water in the paddy field avoiding the

under-irrigation and over-irrigation they can provide irrigation to larger areas of plants with less water spending and inferior pressure. Using this system, one can save manpower, water to get better manufacture and eventually income. Advanced soil moisture level sensor will use in these we can measure different parameter that is pressure, temperature and humidity, of soil. Different amount of water requirements for different types of soil in this according to the type of crop, and water resistance capacity in different seasons, system provide definite amount of water to the plant hence, we can save large amount of water.

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