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Implementation of Micro Controller Based Automatic Plant Irrigation System

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Abstract: This approach uses watering sprinkler method on account that it can water the plants placed in the pots. This scheme makes use of microcontroller board, which consists of AT89S51 Microcontroller. It is programmed in any such means that it's going to sense the moisture level of the plants and supply the water when required. This kind of method is mainly used for general plant care, as a part of caring for small and big gardens. Frequently, the plants have to be watered twice every day, morning and night. So, the microcontroller needs to be coded to water the crops in the garden or farms about two times per day. People revel in plants, their benefits and the feeling involving nurturing them. Nonetheless for most people it becomes challenging to maintain them healthy and alive.

Key Words: Automatic Watering System, Soil Moisture Sensor, MicroController.

I. INTRODUCTION

The continuous increasing demand of food requires the rapid improvement in food production technology. In a country like India, where the economy is mainly based on agriculture and the climatic conditions are isotropic, still we are not able to make full use of agricultural resources. The main reason is the lack of rains & scarcity 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 un-irrigated land. Another very important reason of this is due to unplanned use of water due to which a significant amount of water goes to waste. This problem can be rectified if we use microcontroller based automated irrigation system in which the irrigation will take place only when there will be acute requirement of water.

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. Watering with a hose or oscillator wastes water. Neither method targets plant roots with any significant degree of precision. Automatic irrigation systems can be programmed to discharge more precise amounts of water in a targeted area, which promotes water conservation.This automatic irrigation system senses the moisture content of the soil and automatically switches the pump when the power is on. A proper usage of irrigation system is very important because the main reason is the shortage of land reserved water due to lack of rain, unplanned use of water as a result large amounts of water goes waste. For this reason, we use this automatic plant watering system, and this system is very useful in all climatic conditions.

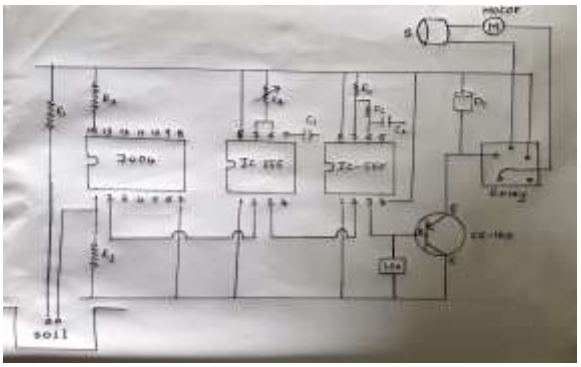

Fig.1 Tradational circuit

II. PROPOSED METHOD

The present system is developed for irrigation of agricultural plantation which is divided into two parts.

A) System hardware

B) System software.

A. System hardware

Micro controller IC AT 89C51:

Program is given to microcontroller to check values of temperature and output of comparator which compares the Vref and amplified voltage of I to V convertor, and make the LED 'ON' for particular time interval. Time interval is different for different ranges of temperature.program is written in assembly language.

Soil moisture sensors:

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners. Soil moisture sensors typically refer to sensors that estimate volumetric water content. Another class of sensors measure another property of moisture in soils called water potential; these sensors are usually referred to as soil water potential sensors and include tensiometers and gypsum blocks.

Sensor Installation

A single sensor can be used to control the irrigation for many zones (where an irrigation zone is defined by a solenoid valve) or multiple sensors can be used to irrigate individual zones. In the case of one sensor for several zones, the zone that is normally the driest, or most in need of irrigation, is selected for placement of the sensor in order to ensure adequate irrigation in all zones.

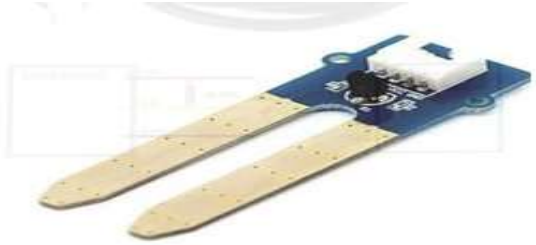

Fig. 2 Soil Moisture Sensor

Some general rules for the burial of the soil moisture sensor are:

a). Sensors should be buried in the root zone of the plants to be irrigated, because this is where plants will extract water. Burial in the root zone will help ensure adequate turf or landscape quality. For turf grass, the sensor should typically be buried at about three inches deep.

b). Sensors need to be in good contact with the soil after burial; there should be no air gaps surrounding the sensor. Soil should be packed firmly but not excessively around the sensor.

c). If one sensor is used to control the entire irrigation system, it should be buried in the zone that requires water first, to ensure that all zones get adequate irrigation. Typically, this will be an area with full sun or the area with the most sun exposure.

d). Sensors should be placed at least 5 feet from the home, property line, or an impervious surface driveway and 3 feet from a planted bed area.

e). Sensors should also be located at least 5 feet from irrigation heads and toward the center of an irrigation zone.

f). Sensors should not be buried in high traffic areas to prevent excess compaction of the soil around the sensor.

Water Pump:

A small pump plus a driver. A driver is to provide enough current for the pump, my application needs a spray distance about one meter, so this pump is

enough. But if you need to make a system that needs a large spray range, we may need larger pumps, or even a pressurized device to make the projectile even farther, such as the watering system in a tea garden.

Fig. 3 Water Pump

Relay Logic System

Two way 5V solid state relay is used in the present system. When the computer scans the high data through the input channel, it sends the high signal to relay to switch ON the 230V AC supply voltage and motor starts. The same controller also sends the appropriate channel data to stepper motor of the scanned sector to open the valve.

GSM Modem

Short Message Service is GSM techniques to transfer data from distant places such as from one area to the area of the same city or from another city .In our project we are using SMS technique to instant or quick transfer of data or notice to the required destination. It is a convenient facility of the GSM network. A message consisting of a maximum of 160 alphanumeric characters can be send to or from a mobile station. If the subscriber's mobile unit is powered of f or has left the coverage area, the message is stored and offered back to the subscriber when the mobile is powered on or has reentered the coverage area of the network. This function ensures that the message will be received.

Fig. 4 GSM Modem

B. System software

System software for data reading and controlling the various devices is written in Assembly language. A simplified diagram of the software is shown in the Fig. 4. Executing the software program the channel is sequentially scanned. Scanning channel 1 data of corresponding channel is read, if it is high, it sends the high signal to the relay which switches the motor to 230 V supply. Motor becomes ON, at the same time Microcontroller sends data signal to the stepper motor 1 which opens the valve of sector number 1 and water starts flowing through the valve to the plants of sector. The process remains in the same state till the data of the same channel does not change, if the data is not high, then system scans the next channel and the process repeats as mentioned above for infinite time period.

III. CONCLUSION

Here the automated plant watering approach has been designed and proven effectually. It has been developed by means of integrated of all of the hardware accessories used. Presence of every module has been reasoned out and positioned cautiously, thus contributing to the first-class working of the unit. As a result, the 89C51 based automated Plant Watering procedure has been designed and verified efficaciously. The method has been validated to function routinely. The moisture sensors measure the moisture level (water content) of the one-of-a-kind plants. If the moisture level is observed to be under the desired degree, the moisture sensor sends the signal to the microcontroller board which triggers the Water Pump to turn on and give the water to respective plant utilizing the Rotating Platform/Sprinkler. When the preferred moisture level is reached, the process halts on its own and the Water Pump is turned OFF. As a result, the performance of the

whole system has been verified absolutely and it's said to function successfully.

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