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EMBEDDED BASED MOISTURE MONITORING AND CONTROL SYSTEM

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Abstract

Agriculture plays the vital role in survival of people in India.Farming is of utmost importance to the survival of the inhabitants of an area. Considering the rate of population growth, there arise the needs to intensify the rate of food crop production so the increasing food demandsas to compensate. A method to reduce the problems associated with farming and as well increase food crop production is the implementation of a controlled technique to meet the soil moisture requirement for different food crops grown in respective locations. The purpose of this project is to provide embedded based system for automated irrigation and to reduce the manual monitoring of the field. This system works in two modes they are Sensor mode and Timer mode. Sensor mode which works based on information provided by soil moisture sensor. Timer mode works based on Time which is set by the user. This system could be the solution to all year round food production, or better still, achieving the arability of every land.

1. Introduction

Agriculture has, throughout History, played a major role in human societies' endeavors to be self sufficient in food. Water scarcity poses serious threats to rural livelihoods and food security. Since scorching summers threatens our planet every year, our farmers are unable to cultivate our traditional crops at their suitable seasons. On other hand farmers wasting water abundant without proper management. This leads to scarcity of water at the time of requirement. At present farmers are doing the irrigation manually, but in this system it is designed to irrigate automatically. Improving irrigation efficiency can contribute greatly to reduce production costs of vegetables, making the industry more competitive and sustainable. Recent technological advances

have made soil water sensors available for efficient and automatic operation of irrigation systems.

SYSTEM ARCHITECTURE

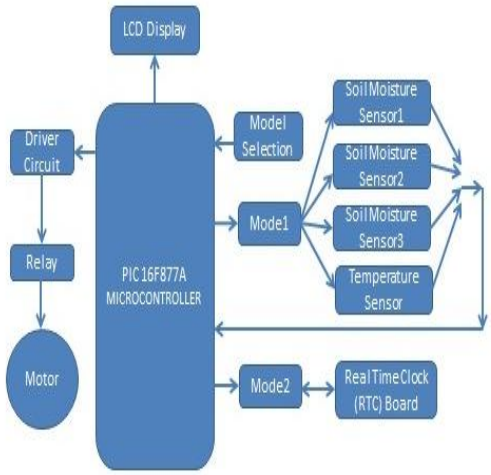

Fig 1. Block diagram of Irrigation System

WORKING PRINCIPLE OF THE SYSTEM

This system controls the water management for an irrigation system by automatic methodusing system which does not require any man power [1][7]. The important parameters are soil moisture sensor and Temperature Sensor(LM 35) it also consists Real Time Clock (RTC), PIC microcontroller and motor. In Sensor Mode, the irrigation can be done based on the values of the sensors measured from the fields i.e. if the values of soil moisture sensors are high it shows that the fields are dry. Those values are sends to microcontroller. Microcontroller switches ON the motor through the relay to supply the water to the fields. According to the size of the fields, numbers of soil moisture sensors are increased because of the undulated surface water cannot spread even to all. If we installed single moisture sensor exact field condition cannot be identified and it does not be the efficient result to irrigate. Due to this reason required number of Soil Moisture Sensors is buried in all sides of the field. These sensors measure the moisture of soil frequently and send to PIC Microcontroller. PIC microcontrollerconstantly monitors the parameters of sensors [3]. The PIC microcontroller converts the analog signal from the moisture sensors which are buried inside the soil, to digital values using inbuilt ADC. This is compared with a predefined value [4], if the soil moisture content of maximum no. of moisture sensors shows low from predefined value, PIC Microcontroller will turn ON the relay, to run the motor to irrigate the fields[6][5].The moisture content of soil by individual sensors in percentage, temperature and status of the motor are displayed in Liquid Crystal Display (LCD). Once the soil has reached desired moisture level the sensor

transmits the signal to PIC microcontroller and it turn OFF the motor to stop the irrigation.

In Timer Mode, irrigation can be done based on time. The suitable irrigation time and duration can be set into the PIC microcontroller. The microcontroller monitors the time constantly when it reaches the fixed time, it turns ON the relay to switch ON the motor to provide the water supply to the fields. When it reaches the specified duration it turns OFF the relay to switch OFF the motor to stop the irrigation. Time can be set by using key switches. To set the time Real Time Clock is used. This mode is very useful to the plants which acquired more water such as pumpkin, watermelon etc. This system helps to save energy as well as improves the crops health. This process is termed scheduling. Every procedure in scheduling is controlled by the program fused in the PIC microcontroller [2].

EXPERIMENTAL RESULTS

Number of soil moisture sensors are buried in the various parts of the field if more No. of soil moisture sensors shows the moisture level less than 20% then the motor will be ON. If the more No. of soil moisture sensors shows the moisture level more than 70% then the motor will be in OFF. This table is explained by the following The following table shows the function of (Timer Mode) Mode 2 The Timer Mode (Mode2) is selected and the irrigation time of 10’0 clock AM/PM is programmed in Microcontroller to Switch ON the motor for irrigation. When the time at RTC reaches the limit specified duration Switch OFF the motor. Convenient time and duration can be changed whenever need. The system provides with several benefits and can operate with less manpower. The system supplies water only when the humidity in the soil goes below the reference in the sensor mode. Due to the direct transfer of water to the roots water conservation takes place and also helps to maintain the moisture to soil ratio at the root zone constant to some extent. Thus the system is efficient and compatible to changing environment. The Timer mode also used to irrigate based on real time programmed in the microcontroller which is most important mode to the plant acquires more water to produce more yields such as pumpkin, watermelon etc. So this proposed system can be used to all type of plants to increase the food production.

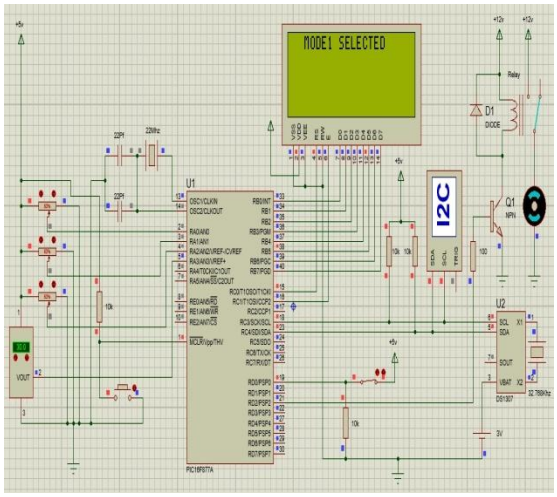

Fig2: Indicates that Mode1 is selected

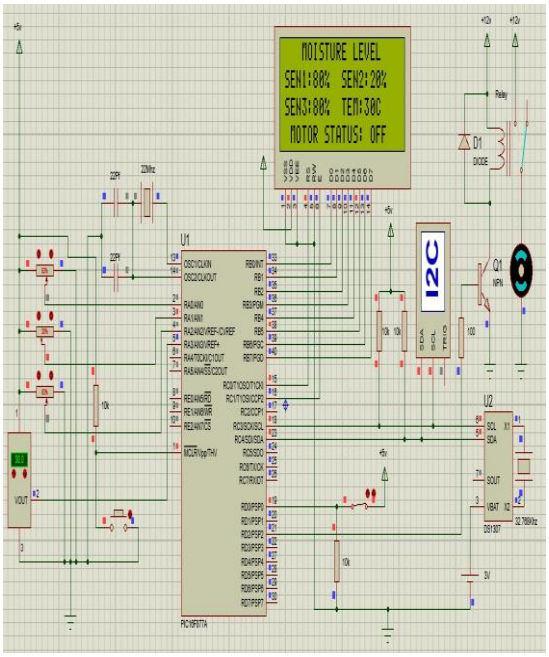

Fig 3. Sensor 1, Sensor 3 shows ≥20% shows ≤20% and the motor status is ON.

With the use of this technique we can reduced water consumption. It can be set to lower and upper thresholds to maintain optimum soil moisture saturation and minimize plant wilting. It can contribute to deeper plat root growth, reduced soil runoff/leaching, less favorable conditions for insects and fungal disease. It is also possible to control the nutrition levels in their entirety thus, lower nutrition costs. No nutrition pollution is released into the environment because of the controlled system. Hence, it will have great saving of irrigation water, stronger, healthier plants and stable, high yields. Hence, definitely it will have improvement in biological fertility.

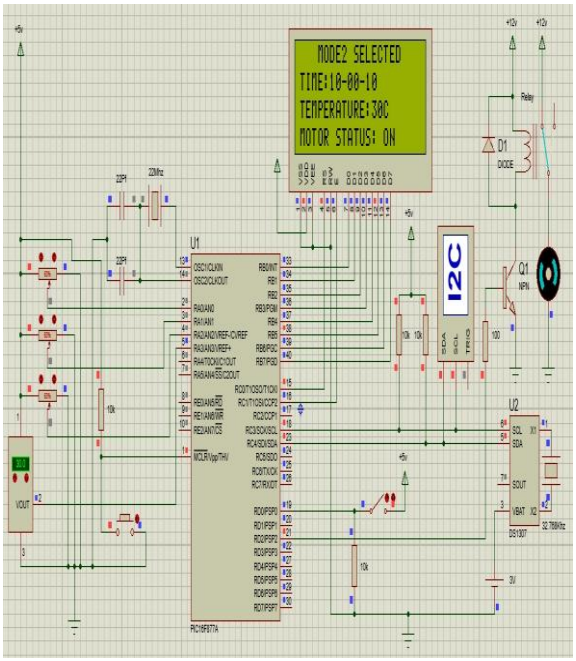

Fig 4 When the time reaches 10.00 AM/PM

CONCLUSION:

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7. Mr. S.G. Galande, Dr. G.H. Agrawal, "Embedded Controlled Drip Irrigation System**"** in this research paper, it is applicable only for large size farms. It requires frequent maintenance and installation and maintenances are difficult. It must be expanded or adjusted to the drip line as plants grow.