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Automatic Irrigation System with Temperature Monitoring

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Abstract - *Water is the basic need for living beings. Indian agriculture is dependent on the monsoons which is not a reliable source of water. In the present days, our country is facing the problem of water scarcity. Therefore there is a need for an irrigation system in the country which can provide water to the farms according to their soil types. This project on "Automatic Irrigation System with temperature monitoring" is intended to create an automated irrigation mechanism which turns the pumping motor ON and OFF on detecting the moisture content of the earth. It also monitors the real time temperature of the farm which is a very crucial factor for the production according to the crop. In the domain of farming, utilization of appropriate means of irrigation is significant. It plays an AVR board ATmega16 micro-controller which is programmed to collect the input signal of changeable moisture circumstances of the earth via moisture detecting system and turns on the water pump whenever the farms requires water.*

Keywords: **Irrigation system, Microcontroller, Moisture detecting system, Temperature monitoring, motor pump.**

1. INTRODUCTION

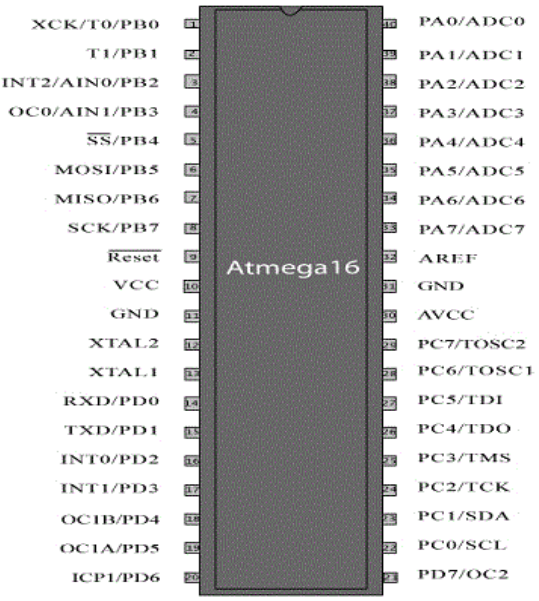
In India, the agriculture plays the important role in the economy and development of the country. At the present era, the farmers have been using conventional techniques in which the farmers irrigate the land at the regular intervals manually. These traditional methods usually use more amount of water and it causes lower production due to inappropriate amount of water usage in irrigation. In order to minimize the water usage and maximize the production rate, there is a need in the residential/commercial irrigation industry for an irrigation controller that responds to soil moisture sensors for conserving water. As Continuous increasing demand of food requires the control in highly specialized greenhouse vegetable rapid improvement in food production technology by using controlled irrigation and real time temperature monitoring. it is a simple and precise method for country like India, where the economy is majorly based on agriculture. It also helps in saving time, reduces the human errors and efforts. The controller should be "user friendly", i.e., easy to program and requiring a minimum number of keys or push-buttons to operate the controller.

2. IRRIGATION SYSTEM

2.1 Description of the Circuit Diagram

ATmega16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing) architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum frequency of 16MHz. ATmega16 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively. ATmega16 is a 40 pin microcontroller. There are 32 I/O (input/output) lines which are divided into four 8-bit ports designated as PORTA, PORTB, PORTC and PORTD. ATmega16 has various in-built peripherals like USART, ADC, Analog Comparator, SPI, JTAG etc. Each I/O pin has an alternative task related to in-built peripherals.

PIN DIAGRAM



Soil Moisture Sensor is a simple breakout for measuring the moisture in soil and similar materials. The soil moisture sensor is pretty straight forward to use. The two large exposed pads function as probes for the sensor, together acting as a variable resistor. The more water that is in the soil means the better the conductivity between the pads will be and will result in a lower resistance.

Temperature sensor (LM35) is a precision IC temperature sensor with its output proportional to the temperature (in ºC). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possess low self heating and does not cause more than 0.1 ºC temperature rise in still air. The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every ºC rise/fall in ambient temperature, *i.e.,* its scale factor is 0.01V/ºC.

LCD is an electronic display module which uses liquid crystal to produce a visible image. The 16×2 LCD display is a very basic module commonly used for displaying alphabets and numeric value. A 16X2 LCD has two registers namely, command and data. The register select is used to switch from one register to other. RS=0 for command register, whereas RS=1 for data register. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

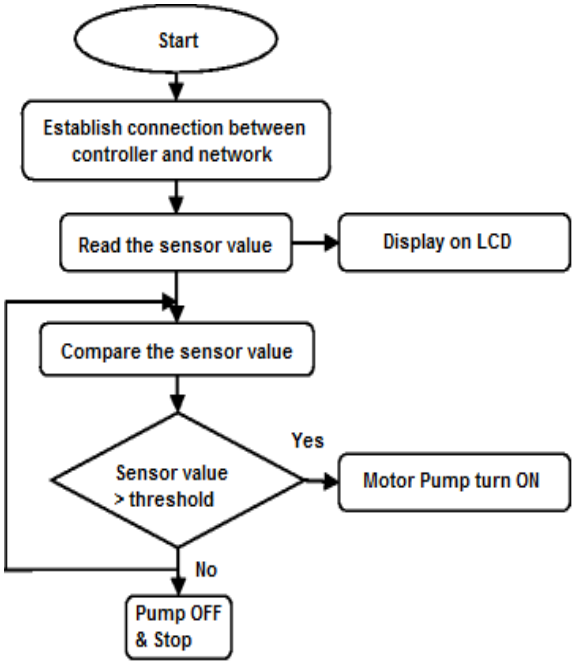
Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. Relays are generally used to switch smaller currents in a control circuit and do not usually control power consuming devices except for small motors and Solenoids that draw low amps Nonetheless, relays can "control" larger voltages and amperes by having an amplifying effect because a small voltage applied to a relays coil can result in a large voltage being switched by the contacts. The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits.

2.2 Working of the system

This project is designed to develop an automatic irrigation system which switches the motor pump ON/OFF on sensing the moisture content of the soil and monitors the real time temperature of the farm. In the field of agriculture, use of proper method of irrigation is important. The advantage of using this method is to reduce human intervention and still ensure proper irrigation. In this project the Moisture sensor, Temperature sensor, LCD, Motor pump are interfaced with Atmega16. Moisture sensor and temperature sensor provides analog signal to Atmega16 microcontroller. Microcontroller needs to convert this analog signal into digital value. The ATmega16 has an inbuilt 8 channel, 10 bit analog to digital converter. Here, we will first convert a 5V signal and then a 0V signal with a reference voltage of 5V of ADC. After each conversion, the analog to digital converter of ATmega16 will give a 10-bit value for each signal (5V and 0V).These outputs of the analog to digital converter are displayed in a 2×8 LCD array. When a 5V signal is converted, the output of analog to digital converter is 0x3ff (1023) and when 0V signal is converted, the output is 0x00 (0).

The status of the water pump , soil moisture and temperature is displayed on the LCD, which is interfaced to the microcontroller. Thus, this automatic irrigation system depends on the output of the moisture sensor. When the moisture sensor sense the soil is dry then the microcontroller turn ON the motor pump and if moisture sensor senses the soil is not dry then microcontroller turn OFF the motor pump.

2.3 Flow chart



3. CONCLUSIONS

It can hereby seen that the combination of hardware and software provides a economic irrigation controlling system which is extremely user friendly because it requires very less human interference for it operations once it is manufactured and implemented. It not only saves the most precious gift of the nature, i.e., water. It also helps the farmers to grow their crops under controlled conditions and under continuous observation by temperature monitoring. Hence, this project "Automatic Irrigation System with temperature monitoring" also helps in increased and good quality productions

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