

Design & Development of Intelligent Quad Temperature Sensor Module for Agricultural Perspective in North India

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ABSTRACT:

This paper focuses on conservation of water by developing microcontroller intelligent based irrigation system. This helps in saving 70-80% of water by automatically providing water to plants fields depending on water requirement. This paper focuses on different types of sensing parameters which are used for measuring environmental condition, also it uses pump-on/off circuitry as per water requirement. It uses quad sensors measuring temperature of leaf (both in sunlight as well as in shaded area), soil, moisture and atmospheric. This application controls water system for gardens with the help of sensors & microcontroller systems.

Keywords: LM35IC, leaf Plant differential temperature, Soil, Moisture, Atmospheric temperature, Sensor.

1. INRODUCTION

The use of Water in agriculture is hot topic for any discussion of water and food security. Agriculture sector is 70% dependent on water withdrawals for the requirement of crops. Irrigation systems in parts of North India has pressurized farmers to produce more with less supplies of water. Today with the enhancement of technology we are using controllers and sensors for reducing manual efforts of farmers which is conserving water as well as their time. This paper focuses on consumption of water and reducing the manual labor on field for irrigation while nourishing the Plant's needs. Irrigation in our country is totally dependent on climatic condition. Though the climate and water content in the root

zone of plant is very challenging. So, both the plant as well as the soil factors may be measure for irrigation planning. For this purpose we are using intelligent monitoring system in field and complete quad temperature sensor module is examined against different types of sensing parameters which are used for measuring the different environmental conditions. This paper focuses on design and development of intelligent quad temperature sensor module for agriculture. We here use AT89S52 microcontroller and LM35 temperature sensor (for measuring atmospheric, Moisture, soil & leaf temperature in shaded as well as in sunlight area,) as main components of this system, LCD (Liquid crystal display) is used to display the temperature. For controlling the temperature relays are used which are connected to water pumps. As soon as the temperature reaches above the set temperature, then motor is turned ON, which provides water to the plant till the temperature goes below the set temperature. After reaching set temperature motor is turned off and scan next condition. This provides adequate amount of water at right time. The programming is performed in Embedded C language.





Fig1.Block diagram of microcontroller based irrigation system

2. PROPOSED METHODLOGY

This monitors the amount of soil, moisture, atmospheric, and leaf temperature status with the help of LM35 sensors. This is simple and useful technique and consists of microcontroller, sensing unit, LCD, relay, water Pump. Also different sensors reads different environmental conditions & on the basis of this inputs are given to microcontroller which in turn display the reading in LCD.An LED indicates the status of pump.

2.1 CIRCUIT DESCRIPTION



Fig2.Circuit Diagram of Intelligent quad temperature Sensor Module

A circuit consists of components like sensors, resistor, capacitor, and relay. The developed sensor circuit is supported to read the sensor output. The designed circuit was powered by a 12 V DC power supply which is then converted to 5V by using voltage regulator. The circuit also comprises of four LM35 IC's ,NE555 integrated circuit,AT89S52 microcontroller,20*4,LCD,transisitor,microswitches ,4 LED's, resistors including voltage regulator and

capacitors. The IC 7805 voltage regulator was used to provide 5V supply to the circuit. The integrated circuit NE555 is used to interface with 0808 to keep ADC in working condition. The ADC is used in the circuit to convert analog output of the LM35 sensor to digital values which will then use by microcontroller unit for irrigation automation. The AT89S52 controller was used in circuit to run the water pump. Also relay is used as a switch that turns ON/OFF the pump connected in the output.

2.2 WORKING

For the Past one decade, some parts of India is suffering from shortage of water for the irrigation. As they are not having proper idea about the availability of the power. This makes farmer totally dependent on the monsoon. But crop failure due to the shortage of water is taking away their interest from agriculture. This design of automatic irrigation may help them reducing their problem. This system automatically senses the temperature and switch ON the pump when the power is on. The intelligent quad temperature sensor module can be used to resolve the problem of wastage of water and this application is suitable for every type of climatic condition. Here we are using a circuit where 230V AC is converted into 12V AC using a step-down Transformer. With help of full bridge rectifier 12 V AC supply is converted to DC supply. But the output of the diode bridge is a not a pure, it consists of ripples or pulsating DC. This pulsating DC can be filtered using a capacitor filter for removing the ripples. So, a capacitor filter helps in smoothening the voltage. Hence pure 12 DC is obtain, now 12 V DC voltage can be stepped down to 5V DC voltage using a DC step-down converter called as regulator. The first 2 digits '78' of IC7805 voltage regulator represents the positive series voltage regulators and the last two digits '05' represents the output voltage of the voltage regulator and parallel we connect LED to it. LCD is used to display the temperature. The data pins of LCD are connected to microcontroller AT89S52. ADC is used to convert the analog signals received from various sensors to



be converted into digital form. Also it is interfaced with relay. The relay works as a switch which turns ON/OFF the pump. This process is done by a Comparator & timer circuit. Timer generates clock frequency pulse, as these frequency is fed to ADC and ADC input interfaced with 4 LM35 temperature sensor. The leaf, soil, atmospheric and moisture sensors are placed accordingly, for example the soil moisture sensor is inserted to the depth of the soil. Here sensor used is LM35 which senses the moisture of soil and compares it with the run time temperature. If the moisture of soil is below threshold then relay which acts as switch will automatically turn on the PUMP & water is provided as per requirement and as soon as moisture of soil is as per threshold value, the Pump will automatically get turn off. Similarly we can measure the temperature of leaf by using LM35 IC. The temperature of leaf can be measure both in shaded as well as in sunlight to get better results and for proper irrigation. The sensors helps in measuring the temperature in sunlight by measuring the dryness as well as wetness of leaf and then comparing it to the set threshold value and accordingly the pump is ON/OFF also temperature is measured in shaded part of leaf also where probe is kept under the leaf.

2.3 HARDWARE



LM35 Sensor: The LM35 sensors is used to measure temperature as per set temperature & it can range up to 100 degree Celsius also it measure temperature more accurately. LM35 IC has been chosen for leaves & air-temperature sensing element because of it high precision.

Relay: It is used as switch to ON-OFF the pump according to the water requirement. Relays works on two modes normally open and normally closed.

AT89S52: AT89S52 performance is high and it is CMOS 8-bit microcomputer with 8K bytes of flash programmable & erasable read only memory.

3. RESULT

The quad temperature sensor module system is a simply designed circuit useful in controlling the temperature to a set value via LM35 temperature sensor in agriculture field. Both the actual and predefined temperatures are displayed on screen of monitor .The Predefined temperature can be set by using preset buttons. This system was developed to monitor the different parameters of environment such as soil, atmospheric, moisture & temperature of leaf. With the help of this we can increase the productivity of crops in agriculture sector. Even the small change in the environment can be recorded by the sensors & hence it maintains temperature accordingly. Also LM35 sensor doesn't need any external calibration for the measurement of temperature and provide the precise output.

4. CONCLUSION

Farming in India is monsoon dependent, the good monsoons helps in increasing the yield whereas the late arrival of monsoon causes the bad yield that results in crop failure. To overcome with this situation we need to deal with the problem of water management. Irrigation in our country uses 80% of the total water, hence in order to improve agriculture output and to our economic development as well, we need to resolve shortage of water for irrigation. This system helps in providing less manual intervention of farmers and also conserve water by directly supplying water in fields when temperature goes above set point. This system is effective and compatible to the changing environment.

5. FUTURE SCOPE



We have designed automatic irrigation system based on sensors and microcontroller which directly senses the temperature and the pump turns On-Off automatically as per set value or threshold to overcome the problem of shortage of water in fields. In advancement and based on future requirement, the sensor can be used to measure other Parameters such as ambient temperature, light intensity. Pesticides & fertilizers can also be further added automatically in the water. IOT based irrigation is also the future of irrigation system or in agriculture sector.

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