AUTOMATIC PLANT IRRIGATION SYSTEM USING MICRO CONTROLLER

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Abstract

This paper provides implementation of "Automatic Plant Irrigation System using micro controller". We have implemented sensors that detect the humidity in the soil (agricultural field) and supply water to the field, which has water requirement. The micro controller based design that controls the water supply and the field to be irrigated. There are sensors present in each field that are not activated till water is present on the field. Once the field gets dry sensors sense the requirement of water in the field and send a signal to the micro controller. Micro controller and associated circuitry then supply water to that particular field which has water requirement till the sensors are deactivated again. In case, when there are more than one signal for water requirement then the micro controller will prioritize the first received signal and irrigate the fields accordingly.

Keywords: Micro controller; Humidity sensor; motor; relay

Introduction

In the fast-paced world human beings require everything to be automated. Water is very essential for our daily routine life. Hence saving of water is equally important and mostly water conservation techniques are useful. Water is basic requirement foe plants, human beings and animals. In agriculture field water is needed in tremendous quantity. So it is essential to control wastage of water. Our life style demands everything to be remote controlled. Apart from few things man has made his life automated. In the world of advance electronics, life of human beings should be simpler hence to make life simpler and convenient, we have made "Automatic plant irrigation system using micro controller". A system of controlling irrigation facilities to help millions of people. This system uses sensor technology with micro controller

to make a smart switching device. The system shows the basic switching mechanism of Water motor/pump using sensors from any part of field by sensing the moisture present in the soil.

1.1 Need of automatic plant irrigation system using micro controller: Automatic irrigation systems helps in water conservation and also it saves money. In case of shortage of water or not properly timed water supply to plants. They get dried and not useful so one has to replace it which will be then very expensive. The proper design and programming of automatic plant irrigation system helps to solve such type of issues because it provides water to plants when it is needed to the targeted area which also provides water conservation.

Software and hardware platform used

2.1 Hardware used

Micro controller, Humidity sensor, Relay, Quad Operational Amplifier as

comparator, Motor, diode resistors and capacitors. Transformer, voltage regulator IC, LED, Transistor.

2.2 Software used

KEIL MICRO VISION (Integrated Development environment) using

C program ming.

BLOCK DIAGRAM:

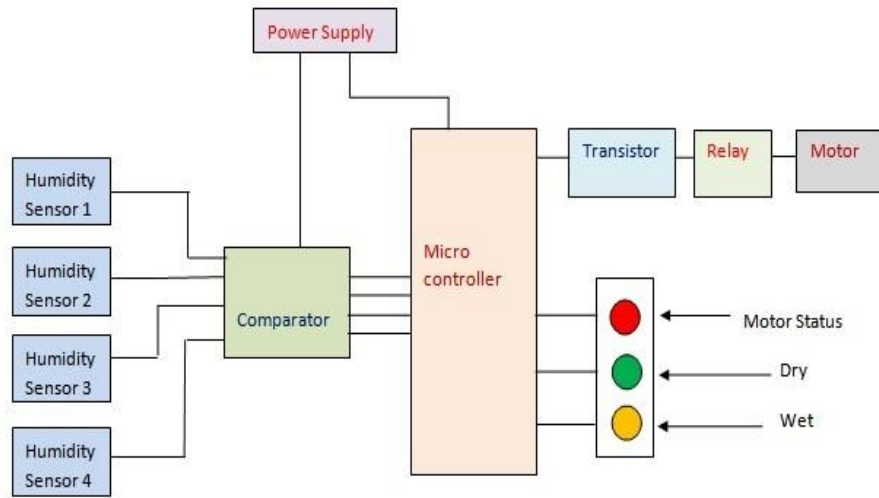The following figure shows the block diagram of automatic plant irrigation system using micro controller.

Fig. Block diagram

Figure 1.1: Block diagram automatic plant irrigation system using micro controller

3.1 Humidity sensor

The humidity or the moisture is sensed by humidity sensor. The current flowing

through the soil is proportional to the change in humidity. The humidity sensor is costly so

for domestic purposes it is designed at home which works on the

principle of conductivity of soil. Dry soil condition is indicated by less conductivity and vice-

versa. The designed humidity sensor consists of two metallic rods and battery of 9 Volt is

used. These two rods are separated by wooden block. These two rods are inserted in the soil.

The rods are connected in series with battery. In case the current flowing through the soil. In

case of dry condition of soil the current is negligible. The current flows in case the soil is wet

and it is sensed.

3.2 Comparator
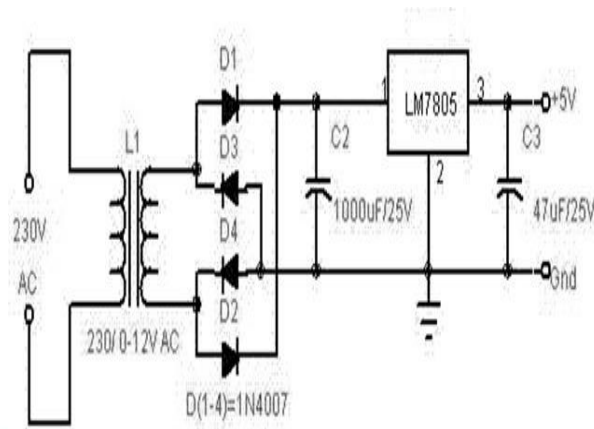
It compares the reference voltage and the signal coming from humidity sensor.

3.3 Micro controller

The automation of designed system is done using micro controller.

3.4 Design of power supply:

The following figure shows regulated power supply.

Fig: Regulated power supply

Power supply consists of a transformer, bridge type rectifier, and voltage-regulating ICs 7805 which provides +5 V, DC power supply is designed to provide VCC as well as reference voltage to the comparator mode ICs.

3.4.1 Step down transformer

Step down transformer converts 230V from AC mains into 12V AC and 0.5 Ampere. Transformer selection is based on the fact that regulator ICs require around 11v as input considering dropout voltage (around 2v), in order to obtain 5v power supply. And current demand of ICs Lm324, micro controller, comparator etc is satisfied using 500mA transformer. Transformer steps down ac voltage from 230v ac to 12v ac. It is then given to bridge rectifier. Bridge rectifier converts ac voltage into pulsating dc. It is then given to regulator IC 7805 which output constant dc voltage. This voltage is given to ICs for reference and also as VCC

Bridge rectifier

Rectifier converts ac voltage into dc voltage. 4 diodes are connected in bridge. Its input is from transformer and output is given to the voltage regulator IC's.

3.4.3 Voltage regulator IC

Voltage regulator IC 7805 gives constant DC voltage at output in spite of fluctuations in input.

3.5 Comparator IC LM324:

The comparison is done with the help of LM324 quad IC. For each comparator voltage division is by using resistors. The output across resistor provides reference to one of the input to comparator. The other input is dependent on the output of Humidity sensor. Depends on the condition of soil either wet or dry the comparison is done and the comparator output changes its state. The output is given to the input port of micro controller.

3.6 Micro controller IC AT89C2051

The AT89C2051 is a low-voltage, high-performance CMOS 8-bit microcomputer with 2K bytes of Flash programmable and erasable read only memory (EPROM). The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry standard MCS-51 instruction set. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C2051 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications. Program is writ- ten for micro controller to check the condition of soil and it is compared with the reference voltage. The output of comparator is applied to input ports of micro controller. After processing by micro controller the specified LED is 'ON' for decided time interval.

3.7 Relay

Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.

3.8 LED

The LED's are used to indicate the various status.LED is used for indicating status of motor, dry condition of soil as well as wet condition of soil. Activation of LED's indicates these status. Automated system operation: The following figure shows the circuit diagram of automatic plant irrigation system using micro controller. The deficiency of water in the field is sensed by the op-amp based sensor. Whenever there is need of water in the particular field, the high signal ('1') appears on the output pin of the sensor of that particular field. The output pins of all the sensors are connected to the PORT 2 of micro controller. The high signal (logic

1) from the sensor is entertained by the micro controller at a particular pin. By knowing the position of the pin on which signal appears , the micro controller rotates the water funnel type cup at the desired angle (i.e. 90 ,180 ,270) by using stepper motor connected at PORT 0 in clockwise direction and switch ON the RELAY (i.e. Water pump) connected at port 0. Now water starts flowing into the required field. After completion of watering the sensor sends low signal (logic 0) to micro controller.
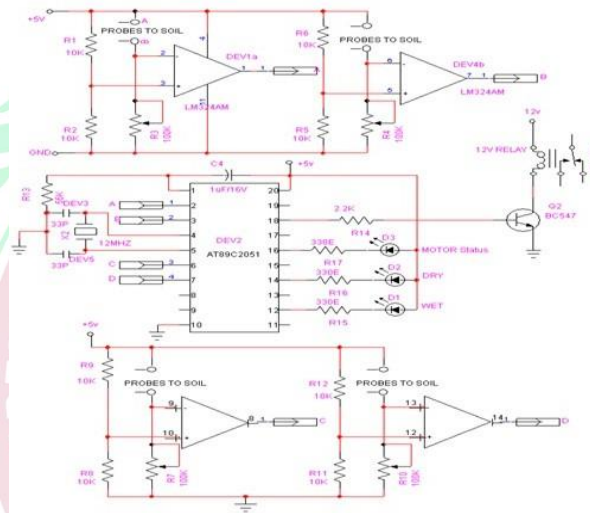
Fig: Circuit diagram of automatic plant irrigation system using micro controller

When micro controller receives this signal , it switches OFF the water pump and rotates the stepper motor in anticlockwise direction to the previous angle to bring the funnel cup in its initial position . now micro controller starts sensing the signal at PORT 2. Whenever there is signal at any pin the micro controller repeats the above process. So this process continues and we get the automatic irrigation the fields by using intelligent device micro controller AT89C2051.

Conclusion: This automated system operates with very less manpower and provides many benefits. This system supplies water to the soil upto the roots if the humidity in the soil just down to reference. It provides water conservation because water is trans- ported upto roots.

This system also indicates motor status, wet condition and dry condition of soil using LED's. So it is useful for maintaining moisture to soil ratio constant. Thus this system is more efficient and compatible for various changing environmental conditions.

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