PROJECT TITLE: "Automatic Irrigation System Using Microcontroller"

Suraj S. Gore, Shubham M. Shinde, Sanket D. Kundurkar, Rupesh C. Sarvade

ELECTRONICS & TELECOMMUNICATION ENGINEERING

SVERI's COLLEGE OF ENGINEERING (POLY.), PANDHARPUR

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Abstract

In the field of agriculture, use of proper method of irrigation is important and it is well known that irrigation by drip is very economical and efficient. In the conventional drip irrigation system, the farmer has to keep watch on irrigation timetable, which is different for different crops. The project makes the irrigation automated. With the use of low cost sensors and the simple circuitry makes these project a low cost product, which can be bought even by a poor farmer. This project is best suited for places where water is scares and has to be used in limited quantity. Also, third world countries can afford this simple and low cost solution for irrigation and obtain good yield on Crops. The heart of the project is the Intel 89c2051microcontroller. The humidity sensors are constructed using aluminum sheets and housed in easily available materials. The aim is to use the readily available material to construct low cost sensors. Five relays are controlled by the microcontroller through the transistor BC547. One relay is used to shut-off the main motor which is used to pump the water to the field.

Keyword: microcontroller, solenoid control, humidity, temperature, soil moisture

Introduction:-

The continuous increasing demand of the 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 waste. In the modern drip irrigation systems, the most significant advantage is that water is supplied near the root zone of the plants as per requirement to which a large quantity of water is saved. At the present era, the farmers have been using irrigation technique in India through the manual control in which the farmers irrigate the land at the regular intervals. This process sometimes consumes more water or sometimes the water reaches late due to which the crops get dried. Water deficiency can be detrimental to plants before visible wilting occurs. Slowed growth rate, lighter weight fruit follows slight water deficiency. This problem can be perfectly rectified if we use automatic micro controller based drip irrigation system in which the irrigation will take place only when there will be intense requirement of water.

Irrigation system uses soil moisture sensor to turn irrigation ON and OFF. These valves may be easily automated by using controllers and soil moisture sensor. Automating farm or nursery irrigation allows farmers to apply the right amount of water at the right time, regardless of the availability of labor to turn valves on and off. In addition, farmers using automation equipment are able to reduce runoff from over watering saturated soils, avoid irrigating at

the wrong time of day, which will improve crop performance by ensuring adequate water and nutrients when needed. It also helps in time saving, removal of human error in adjusting available soil moisture levels and to maximize their net profits.

Literature Review:

This paper describes an application of a wireless sensor network for low cost wireless controlled irrigation solution and real time monitoring of water content of soil based on soil moisture sensors. Precision water saving irrigation automatic control system by plant physiology is discussed in Shock, C.C., J.M. Barnum, and M. Seddigh.
The wireless sensor network is used for precision agriculture where real time data of pest control in order to offset the adverse conditions. The environmental properties are sensed and relayed to a central repository. An optimized agricultural production by carefully tailoring soil and crop management to correspond to the unique condition found in each field while maintaining environmental quality . The problem of power distribution provided an overview of wireless sensor network by managing the equal power distribution by using GSM network. The system sets the irrigation time depending on the temperature and humidity reading from sensors and type of crop and can automatically irrigate the field when unattended. Information is exchanged between far end and designed system via SMS on GSM network. GSM operates through SMS and is the link between ARM processor and centralized unit. The project aims to implement the basic application of atomizingthe irrigation field by programming the components and building the necessary hardware. This project is used to find the exact field condition. GSM is used to inform the user about the exact field condition. The information is given on user request in for of SMS.

Definition of Irrigation :-

Irrigation is the artificial application of water to the soil usually for assisting in growing crops. In crop production it is mainly used in dry areas and in periods of rainfall shortfalls, but also to protect plants against frost.

Drip irrigation also known as trickle irrigation is an irrigation method which minimizes the use of water and fertilizer by allowing water to the roots of plants, either onto the soil surface or directly onto the root zone, through a network of pipes, tubing, and emitters

Methodology:–

The conventional irrigation methods like overhead sprinklers, flood type feeding systems usually wet the lower leaves and stem of the plants. The entire soil surface is saturated and often stays wet long after irrigation is completed. Such condition promotes infections by leaf mold fungi. The flood type methods consume large amount of water and the area between crop rows remains dry and receives moisture only from incidental rainfall. On the contrary the drip or trickle irrigation is a type of modern irrigation technique that slowly applies small amounts of water to part of plant root zone. Drip irrigation method is invented by Israelis in 1970s. Water is supplied frequently, often daily to maintain favorable soil moisture condition and prevent moisture stress in the plant with proper use of water resources.

Its shape depends on soil characteristics. Drip irrigation saves water because only the plant’s root zone receives moisture. Little water is lost to deep percolation if the proper amount is applied. Drip irrigation is popular because it can increase yields and decrease both water requirements and labor.

Lower operating pressures and flow rates result in reduced energy costs. A higher degree of water control is attainable. Plants can be supplied with more precise amounts of water. Disease and insect damage is reduced because plant foliage stays dry. Operating cost is usually reduced. Federations may continue during the irrigation process because rows between plants remain dry. Fertilizers can be applied through this type of system. This can

result in a reduction of fertilizer and fertilizer costs. When compared with overhead sprinkler systems, drip irrigation leads to less soil and wind erosion. Drip irrigation can be applied under a wide range of field conditions

Design of Micro controller Based Irrigation System:–

The key elements that should be considered while designing a mechanical model: -.

a) Soil Type and Root Structure: – The soil type will dictate how a regular drip of water on one spot will spread. Sandy soil requires closer emitter spacing as water percolates vertically at a fast rate and slower horizontally. With a clay soil water tends to spread horizontally, giving a wide distribution pattern. Emitters can be spaced further apart with clay type soil. A loamy type soil will produce a more even percolation dispersion of water. Deep-rooted plants can handle a wider spacing of emitters, while shallow rooted plants are most efficiently watered slowly (low gap emitters) with emitters spaced close together. On clay soil or on a hillside, short cycles repeated frequently work best. On sandy soil, applying water with higher gap emitters lets the water spread out horizontally better than a low gap emitter.

b) Timing: - Watering in a regular scheduled cycle is essential. On clay soil short cycles repeated frequently work best to prevent runoff, erosion and wasted water. In sandy soils, slow watering using low output emitters is recommended. Timers help prevent the too-dry/too-wet cycles that stress plants and retard their growth. They also allow for watering at optimum times such as early morning or late evening.

c) Watering Needs: - Plants with different water needs may require their own watering circuits. For example, orchards that get watered weekly need a different circuit than a garden that gets watered daily. Plants that are drought tolerant will need to be watered differently than plants requiring a lot of water.

The components of micro controller based drip irrigation system are as follows: -

I) Pump

II) Soil Moisture Sensors.

III) Micro controller Unit AT89C2051 (The brain of the system).

VI) Relay

V) Transistor & row electronic materials

Experimentation: -

The automated control system consists of moisture sensors Signal conditioning circuit.

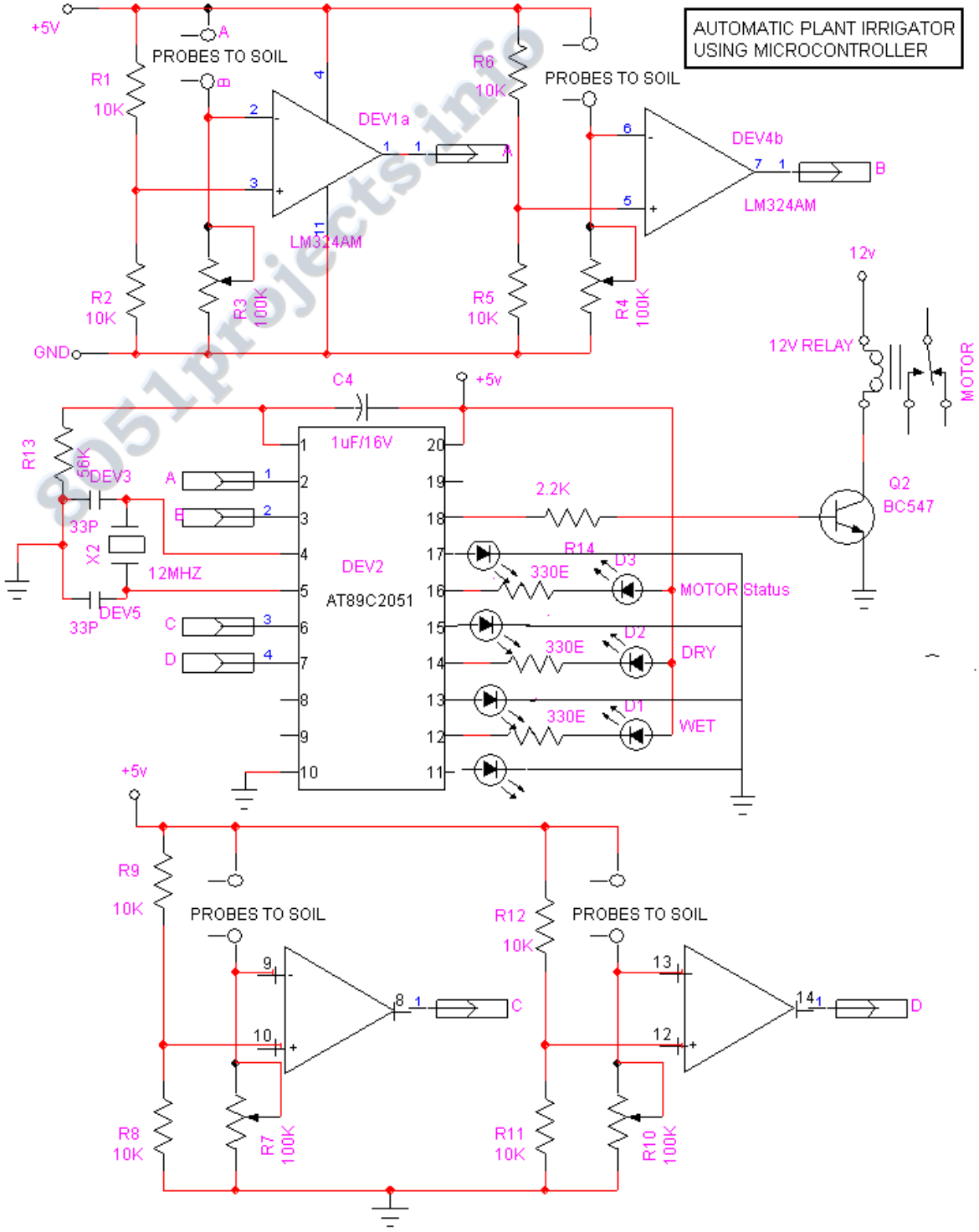

Fig:- Circuit diagram for automatic irrigation system

The important parameters to be measured for automation of irrigation system are soil moisture sensor. The entire field is first divided in to small sections such that each section should contain one moisture sensor and a temperature sensor. These sensors are buried in the ground at required depth. Once the soil has reached desired moisture level the 0sensors send a signal to the micro controller to turn off the relays, which control the valves.
SENSOR

The signal send by the sensor is boosted unto the required level by corresponding amplifier stages. Then the amplified signal is fed to A/D converters of desired resolution to obtain digital form of sensed input for microcontroller use.

Sensor

The three different red LEDs can be used in the system to sense outputs is dry or weight of all the sensors and the current status & motor status. The water is controlled by microcontroller though relays. And four blue color LEDs are use to indicate which sensor senses appropriate moisture with respect to the piece of land where the sensor is in ground.

CONCLUSION

The Microcontroller based irrigation system proves to be a real time feedback control system which monitors and controls all the activities of irrigation system efficiently. The present proposal is a model to modernize the agriculture industries at a mass scale with optimum expenditure. Using this system, one can save manpower, water to improve production and ultimately profit.