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Automation In Irrigation System Using Soil Moisture System

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ABSTRACT

This project on "Automatic Irrigation System on Sensing Soil Moisture Content" is intended to create an automated irrigation mechanism which turns the pumping motor ON and OFF on detecting the moisture content of the earth. In the domain of farming, utilization of appropriate means of irrigation is significant. The benefit of employing these techniques is to decrease human interference and still make certain appropriate irrigation. This automated irrigation project brings into play an AT89552 micro-controller, is programmed to collect the input signal of changeable moisture circumstances of the earth via moisture detecting system.

KEYWORDS: Fibraction of The System Using Aluminum Or S.S, Microcontroler, Soil Moisture Sensor.

INTRODUCTION

Continuous increasing demand of food requires the control in highly specialized greenhouse vegetable rapid improvement in food production technology. In a production and it is a simple, precise method for country like India, where the economy is mainly based on irrigation. It also helps in time saving, removal of human agriculture and the climatic conditions are isotropic, still error in adjusting available soil moisture levels and to we are not able to make full use of agricultural resources. Maximize their net profits. The main reason is the lack of rains & scarcity of land Irrigation is the artificial application of water to the soil reservoir water. The continuous extraction of water from usually for assisting in growing crops. In crop production earth is reducing the water level due to which lot of land is it is mainly used in dry areas and in periods of rainfall coming slowly in the zones of un-irrigated land. Another shortfalls, but also to protect plants against frost Very important reason of this is due to unplanned use of Types of Irrigation water due to which a significant amount of water goes to surface irrigation waste. Localized irrigation in modern drip irrigation systems, the most significant Drip Irrigation advantage is that water is supplied near the root zone of sprinkler irrigation.

OBJECTIVE:

In this project we used aluminium for fabrication:

1. It is used due to its light weight property
2. It is used generally portable system of metal sheets

3. Aluminium can easily undergo any type of mechanical process such as cutting welding casting.

In this project we used AT89552 micro-controller:

1. It is used to measure the parameters such as soil moisture and temperature.
2. It is generally used for boost the signals up to the required mark by which the user can turn OFF the equipment.

ADVANTAGES:

1. The microcontroller drip irrigation system proves to be real time feedback based system.
2. It is used to save the man power and water to improve production and profits.
3. This is very useful to all climatic conditions and it is economically simple
4. It is simple to design and install.

LITERATURE REVIEW

Muhammad et al (2010): A simple approach to Irrigation control problem using Artificial Neural Network Controller. The proposed system is compared with ON/OFF controller and it is shown that ON/OFF Controller based System fails miserably because of its limitations. On the other hand ANN based approach has resulted in possible implementation of better and more efficient control. These controllers do not require a prior knowledge of system and have inherent ability to adapt to the changing conditions unlike conventional methods. It is noteworthy that ANN based systems can save lot of resources (energy and water)and can provide optimized results to all type of agriculture areas. Kalyan et al (2011): The need for systems that make agriculture easier and more sustainable has increased within the past few years. The ability to conserve two of the most important resources of a farmer, water and time, has been the latest challenge. A system that provides this ability - through the use of efficient and reliable methods such as wireless sensor networking, sprinkler irrigation, GSM, SMS technologies and readily available mobile phone devices – is certain to help the farmers get a better yield and on a larger scale, help the agricultural and economic growth of the country.

Prisilla et al (2012) : Water is one of nature's most important gifts to mankind, because of the increase in population food requirement for human being is also increasing. Over the past few decade usage of water for irrigation has increased hysterically. Water is polluted due to wastage and contaminants in the industries. Saving water is more important. This ultimate aim can be achieved by using the exiting ANN control system. It will provide a way to save flood water in the fields for future irrigation purpose

Cosmin (2012): This investigation demonstrates that there is an unquestionable growing tendency in the adoption of artificial intelligence in agriculture. Computerized expert systems cover a broad area of farming but their number and complexity vary considerably from country to country. Underdevelopment of the IT infrastructure in many countries is the first obstruction in using them, only around 30% of the world

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population currently having access to these new technologies.

YETHIRAJ et al (2012): There is a growing number of applications of data mining techniques in agriculture and a growing amount of data that are currently available from many resources. This is relatively a novel research field and it is expected to grow in the future. There is a lot of work to be done on this emerging and interesting research field. The multidisciplinary approach of integrating computer science with agriculture will help in forecasting/managing agricultural crops effectively.

Methodology

The system is a sustainable solution to enhance water use efficiency (WUE) in the agricultural fields. It provides water for plants according to the crop water requirement and operates according to the soil moisture condition of the root zone of plants. Thus it reduces excessive pressure on farmers to pay additional water tariff on water. In addition pump water irrigation also save additional cost for water pumping, Further, automated irrigation system allows farmers to apply the right amount of water at the right time. Besides, human attention was reduced on irrigation significantly. Moreover, energy consumption on water pumps could be reduced by efficient water allocation based on the crop water requirement.

The main hypothesis in regards to this work is that using sensor technology to automate irrigation in which it improves water usage efficiency. This is due to the fact that the sensors could provide information about the water content of the environment to an irrigation controller, and preset watering of plants could be adjusted to suit current conditions. Experimental setups were arranged and experimented using relevant hardware components and software components.

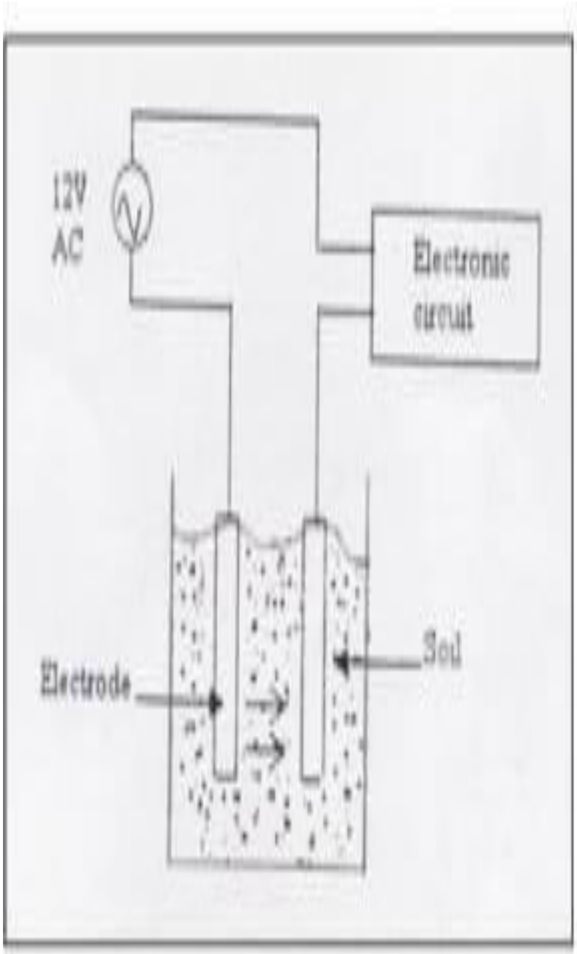
A. Hardware design

When consider the main hardware components, PIC16F887 microcontroller was used to regulate the operation of solar battery and the water pump. Meteorological parameters and electrical parameters were taken as inputs for the microcontroller. Solar intensity and soil moisture levels were considered as the meteorological inputs which were detected by different sensors.

B. Soil moisture Sensor

A probe containing electrodes is used as soil moisture detector. For this work, the nails are used to act as soil moisture probe. The electrodes are inserted into the soil. When the soil is in damp condition, more current will flow between two electrodes because of the presence a lot of ion OH- andH2 from water molecule (H_2O) and vice versa. The figures 2 & 3 show the connection setting on two electrodes, circuit diagram of the sensor and the picture of soil moisture sensor.

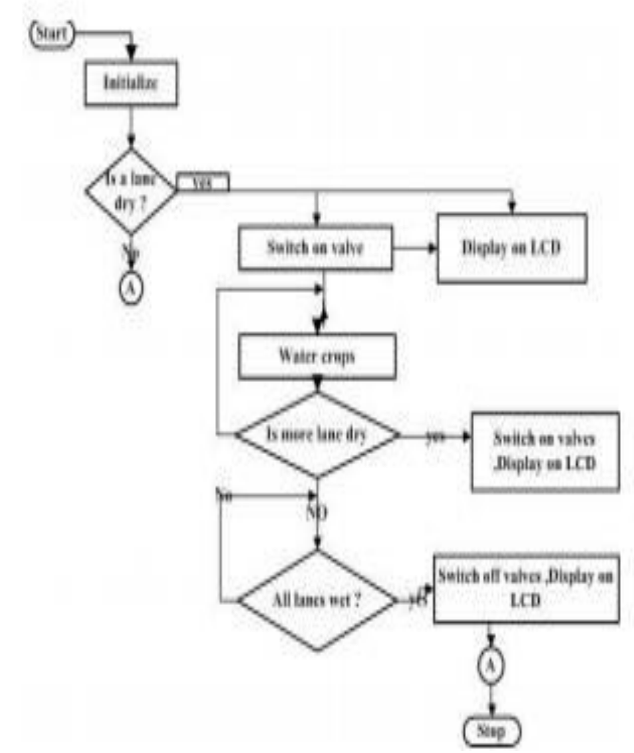
These include the use of a locally made moisture sensor. This is just as simple as a pair of probe made of stainless steel metal; this is preferable since it doesn't corrode easily. This sensor works on the principle of measuring soil conductivity which is proportional to the moisture content of the soil. The first half serves as the anode and the second half serves as the cathode, the soil conductivity forms a conductive path across the probe and the Voltage across the probe is read off.



Connection setting on Electrodes

C. Software Design

The system can be represented using algorithms and algorithms are designed using flowcharts. Irrigation Algorithms Referring to figure 5, the logics of the algorithm help to identify whether water is flooding to the field or whether water is below the minimum level in the tanker. Further, logics and decision making conditions help soil moisture condition of the soil and it always maintain of moisture in the field.



Flowchart for the soil moisture sensor

In the algorithm, when system starts a new clock cycle, it initialize and at the decision making point it evaluates whether current cycle all dry and it indicates as the field in the critical stage and intelligent system give a signals to operate the Valves. It needs further information to make a decision. Thus, it evaluates the stored data of the previous cycle. If previous cycle is low level, then pump will be activated operating to fill water into the tanker.

Irrigation becomes easy, accurate and practical with the same soil sample impossible. Because of the idea above shared and can be implemented in agricultural difficulties of accurately measuring dry soil and water fields in

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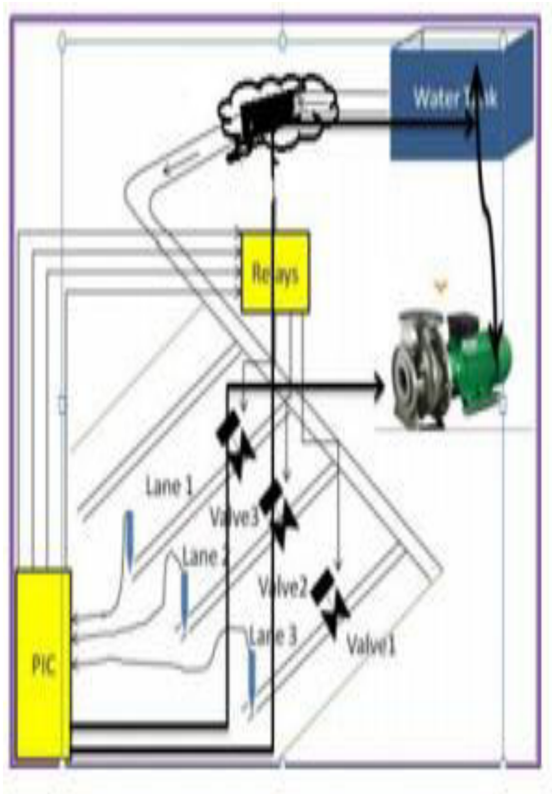
future to promote agriculture to next level. The Volumes, volumetric water contents are not usually output from moisture sensor and level system plays major determined directly. Role in producing the output

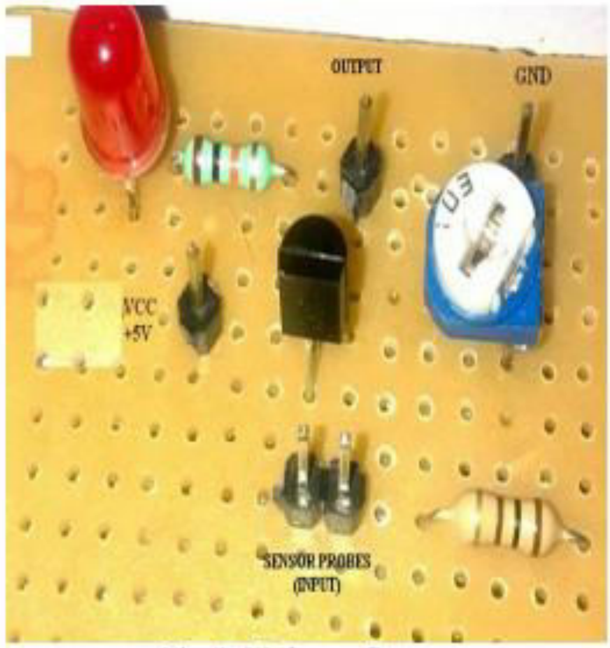
RESULTS

WORKING PRINCIPLE OF THE SYSTEM

The system consists of Soil Moisture Sensor, a PIC Microcontroller and a Relay interface board. The irrigation system consists of Lanes through which each segment of the land is flooded and the flooding is controlled using valves as shown in the Figure 5. There is also a motor pump that is used to fill the water Tanker.

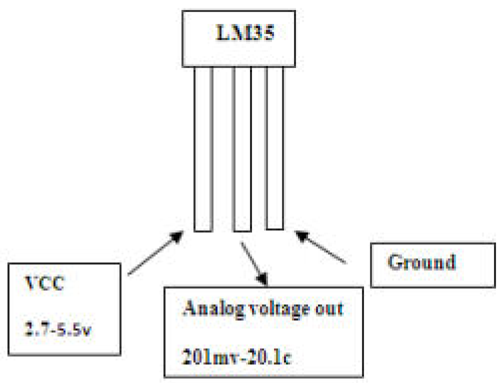


Circuit diagram



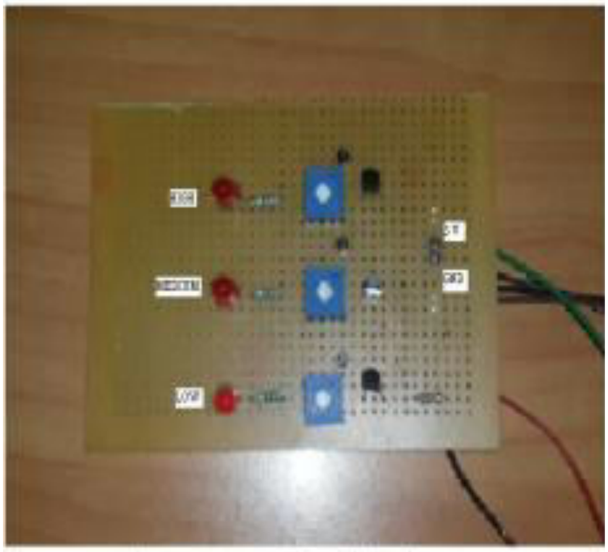
Moisture sensor

Another important feature of this circuit is induction of Precision Centigrade Temperature Sensors. The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in °C). With an LM35, temperature can be measured more accurately than using a thermostat. The sensor circuitry is sealed and not subject to oxidation. The LM35 generates a higher output voltage than thermocouples and may not require the output voltage be amplified as shown in the below figure.



Precision Centigrade Temperature Sensors

Water level indicator the model consists of a series of tanks arranged one below the other. The volume of the tanks is in descending order. Water flows from the top tank through outlets at the bottom. Three tanks or tropic levels chosen for the model is the optimum number required to analyse the effect of top down and bottom up controls. Each tank has two outlets, outlet A and outlet B. Each outlet has the water flow through it regulated by means of valves. These valves are controlled by floats in the tanks. The system used microcontroller to automate the process of water pumping in an over-head tank storage system and has the ability to detect the level of water in a tank, switch on/off the pump accordingly and display the status on an LCD screen.



Water indicator

Watering Times and intervals for watering differ according to the type of plant. The most important factor to remember is the depth of the root zone and soil composition. The deeper the roots and the finer the soil, the longer the watering time must be, then the frequency of watering will be reduced.

SIMULATION AND NUMERICAL ANALYSIS

Simulation setups were arranged and experimented using relevant hardware components and software components. Sensor parts of the circuit was developed using locally. Soil probes used to detect soil moisture levels. Soil sensors and actuators PIC microcontroller was used for decision making process. Predefined operational conditions were used to operate the system without any failure. Algorithms were developed logically and it was used for software development of the system. C programming language was used to write the program in to the microcontroller. From Figure 6, we can see the valves are currently on, the give this information to the MCU an input via Port B and their corresponding number is displayed on the LCD.

A sensor is the part of the developed measurement system that is in contact with the measured environment and transforms the measured entity into an electrical signal. In this work their principle operation, is represented by switches.

Liquid /water level sensors, Liquid (water) level sensors and motor mump here, unlike the field sensors, the interaction of tanker level and the motor pump is controlled by using two liquid sensors i.e. the lower sensor, which indicates insufficient of water and that of the upper sensor, which indicates full of water in the tanker. As per the level of the water in the tanker and the way how the sensors and the motor pump interact is shown in the following table.

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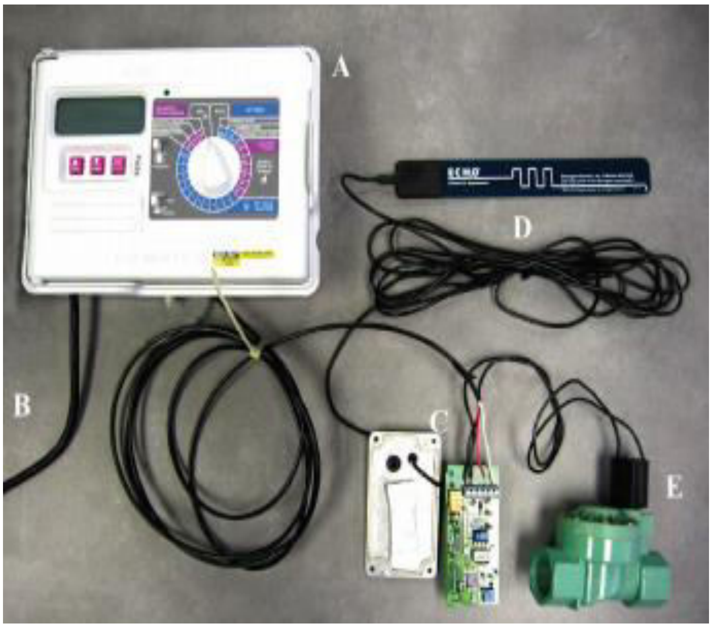
Water level	Lower level(L)	Upper Level(U)	motor pump
Above both L & U	Off	Off	Off
Above L & below U	Off	On	Off
Below both L & U	On	On	On



Equipment used for automatic irrigation in agriculture

INPUTS AND OUTPUTS OF LIQUID SENSORS

The irrigation savings of switching tension meters set at 15 kPa on a coarse soil compared to farmer practices was 70%. The GMS-controlled system failed to bypass most irrigation events due to slow response time. Tomato yields were similar across all soil-water-based control systems and the farmer field. Shock et al. (2002) described a system to irrigate onion with frequent bypass control using GMS.

The overall water used was slightly lower than calculated crop evapotranspiration with acceptable yields. Although dielectric sensors have only found limited use in vegetable production, research to date shows promising results in terms of water savings.

Conclusion

As water supplies become scarce and polluted, there is a need to irrigate more efficiently in order to minimize water use and chemical leaching. Recent advances in soil water sensoring make the commercial use of this technology possible to automate irrigation management for vegetable production. However, research indicates that different sensors types may not perform alike under all conditions. Reductions in water use range as high as 70% compared to farmer practices with no negative impact on crop yields. Due to the soil's natural variability, location and number of soil water sensors may be crucial and future work should include optimization of sensor placement. Additional research should also include techniques to overcome the limitation of requiring a soil specific calibration.

In this work, we successfully develop a system that can help in an automated irrigation system by analysing the moisture level of the ground. The grounded sensors all around the farming land will give notification about the need of water and accordingly it will be supplied. Simultaneously we configured an automated approach for the water tanker to be filled when it is empty. In our future work we are planning to have an automated irrigation system with the help of wireless sensor network.

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