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Automatic Irrigation System Using Arduino

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Abstract

India is the agriculture based country. Our ancient people completely depended on the agricultural harvesting. Agriculture is a source of livelihood of majority Indians and has great impact on the economy of the country. In dry areas or in case of inadequate rainfall, irrigation becomes difficult. So, it needs to be automated for proper yield and handled remotely for farmer safety. Increasing energy costs and decreasing water supplies point out the need for better water management. Irrigation management is a complex decision making process to determine when and how much water to apply to a growing crop to meet specific management objectives. If the farmer is far From the agricultural land he will not be noticed of current conditions. So, efficient water management plays an important role in the irrigated agricultural cropping systems.

A low cost alternative solution for efficient water management currently in use is drip irrigation systems that consist of an automated controller to turn on & off the control values, which in turn helps the farmers by managing the water supply to the crop fields and further maintains the moisture levels of soil that helps in better crop production. This project probes into the design of the automated irrigation system based on Arduino. This Embedded project is to design and develop a low cost feature which is based on embedded platform for water irrigation system. This project uses temperature and soil moisture sensors to detect the water quantity present in agriculture. The project uses Arduino micro controller which is controller to process the information.

The aim of the implementation was to demonstrate that the automatic irrigation can be used to reduce water use.

Keywords:

Agriculture, water Management, soil moisture sensor and arduino.

1. INTRODUCTION

By using the concept of modern irrigation system a farmer can save water up to 50%. This concept depends on two irrigation methods those are: conventional irrigation methods like overhead sprinklers, flood type feeding systems i.e. wet the lower leaves and stem of the plants. The area between the crop rows become dry as the large amount of water is consumed by the flood type methods, in which case the farmer depends only on the incidental rainfalls. The crops are been infected by the leaf mold fungi as the soil surface often stays wet and is saturated after irrigation is completed.

Overcoming these drawbacks new techniques are been adopted in the irrigation techniques, through which small amounts of water applies to the parts of root zone of a plant. The plant soil moisture stress is prevented by providing required amount of water resources frequently or often daily by which the moisture condition of the soil will retain well. The diagram below shows the entire concept of the modern irrigation system. The traditional techniques like sprinkler or surface irrigation requires / uses nearly half of water sources. Even more precise amounts of water can be supplied for plants. As far as the foliage is dry the plant damage due to disease and insects will be reduced, which further reduces the operating cost.

The dry rows between plants will leads to continuous federations during the irrigation process. Fertilizers can be applied through this type of system, and the cost required for will also reduces. The erosion of soil and wind is much reduced by the recent techniques when compared with overhead sprinkler systems. The soil characteristics will define the form of the dripping nature in the root zone of a plant which receives moisture.

As the method of dripping will reduce huge water losses it became a popular method by reducing the labor cost and increasing the yields. When the components are activated, all the components will read and gives the output signal to the controller, and the information will be displayed to the user (farmer). The sensor readings are analog in nature so the ADC pin in the controller will convert the analog signals into digital format. Then the controller will access information and when the motors are turned On/Off it will be displayed on the LCD Panel.

1.1 Motivation

The motivation for this project came from the countries where economy is based on agriculture and the climatic conditions lead to lack of rains & scarcity of water. Irrigation is moreover the backbone of Agricultural industry .Due to inadequate knowledge of proper utilization of water resource, lots of water is wastage in the application of irrigation system.So to overcome this problem , it is necessary to make the system automate with the help of modern technology

1.1 Problem Definition

Irrigation of plants is usually a very time- consuming activity, to be done in a reasonable amount of time, it requires a large amount of human resources.

Traditionally all the steps were executed by humans. Nowadays some systems use technology to reduce the number or workers or the time required to water the plants. With such systems, the control is very limited, and many resources are still wasted.

Water is one of these resources that are used excessively. Many irrigation is one method used to water the plant. This method represents massive losses since the amount of water given is in excess of the plants needs. The excess water is evacuated by the holes of the pots in greenhouses, or it percolates through the soil in the fields.

The contemporary perception of water is that of a free renewable resource that can be used in abundance. It is therefore reasonable to assume that it will soon become a very expensive resource everywhere. In addition to the excess cost of water labor is becoming more and more expensive. As a result, if no effort is invested in optimizing these resources, there will be more money involved in the same process. Technology is probably a solution to reduce costs and prevent loss of resource, this project can be a strong way to tackle such a situation.

1.2 Scope of Project

Day by day, the field of electronics is blooming and have caused great impact on human beings. The project which is to be implemented is an automated irrigation method and has a huge scope for future development. The project can be extended to greenhouses where manual supervision is far and few in between. The principle can be extended to create fully automated gardens and farmlands. Combined with the principle of rain water harvesting, it could lead to huge water savings if applied in the right manner. In agricultural lands with severe shortage of rainfall, this model can be successfully applied to achieve great results with most types of soil.

By developing a Smart Wireless Sensor and by using upcoming techniques a farmer can increase his profit by solving different problems that are faced by the farmer in his routine life. And also to involve Arduino – Controller with a video capturing by using an MMS facility about the crop position and at the same time sending video to the farmer.

2.SOFTWARE AND HARDWARE REQUAIREMENT

1.Hardware:

Temperature Sensor (LM35):

The device is used with single power supplies, or with plus and minus supplies. As the LM35 device draws only 60 µA from the supply, it has very low self-heating of less than 0.1°C in still air.

Humidity Sensor (DHT11) :

A Humidity sensor also called a hygrometer, measures and regularly reports the relative humidity in the air. A humidity sensor senses relative humidity. This means that it measures both air temperature and moisture. Relative humidity, expressed as a percent, is the ratio of actual moisture in the air to the highest amount of moisture air at that temperature can hold. The warmer the air is, the more moisture it can hold, so relative humidity changes with fluctuations in temperature. The most common type of humidity sensor uses what is called “capacitive measurement

Soil Moisture Sensor:

Although soil water status can be determined by *direct* (soil sampling) and *indirect* (soil moisture sensing) methods, direct methods of monitoring soil moisture are not commonly used for irrigation scheduling because they are intrusive and labor intensive and cannot provide immediate feedback. Soil moisture probes can be permanently installed at representative points in an agricultural field to provide repeated moisture readings over time that can be used for irrigation management. Special care is needed when using soil moisture devices in coarse soils since most devices require close contact with the soil matrix that is sometimes difficult to achieve in these soils.

Arduino Micro-controller:

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. We can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so we use the Arduino programming language (based on wiring), and the Arduino Software(IDE), based on Processing.

Water Pump :

The water pump is used to artificially supply water for a particular task. It can be electronically controlled by interfacing it to a microcontroller. It can be triggered ON/OFF by sending signals as required. The process of artificially supplying water is known as pumping. There are many varieties of water pumps used. This project employs the use of a small water pump which is connected to a H-Bridge.

The pumping of water is a basic and practical technique, far more practical than scooping it up with one's hands or lifting it in a hand-held bucket. This is true whether the water is drawn from a fresh source, moved to a needed location, purified, or used for irrigation, washing, or sewage treatment, or for evacuating water from an undesirable location. Regardless of the outcome, the energy required to pump water is an extremely demanding component of water consumption. All other processes depend or benefit either from water descending from a higher elevation or some pressurized plumbing system.

Motor Driver :

Because of very low current requirement, these motors can easily operate with small batteries and solar panels. Quiet and smooth operation of this motor makes it a perfect choice for indoor and long hours of operation.

Direction of rotation: Counter-Clockwise when viewing from the output shaft end with positive voltage applied to positive terminal.

2.Software:

Arduino Software (IDE) :

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students with or without a background in electronics and programming.

Arduino is an open-source prototyping platform based on easy-to-use hardware and software.

Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a message - and turn it into an output - activating a motor, turning on an LED, publishing something online and many more.

You can tell your board what to do by sending a set of instructions to the microcontroller on the board.

To do so you use the Arduino programming language (based on Wiring), and theArduino Software (IDE), based on Processing.

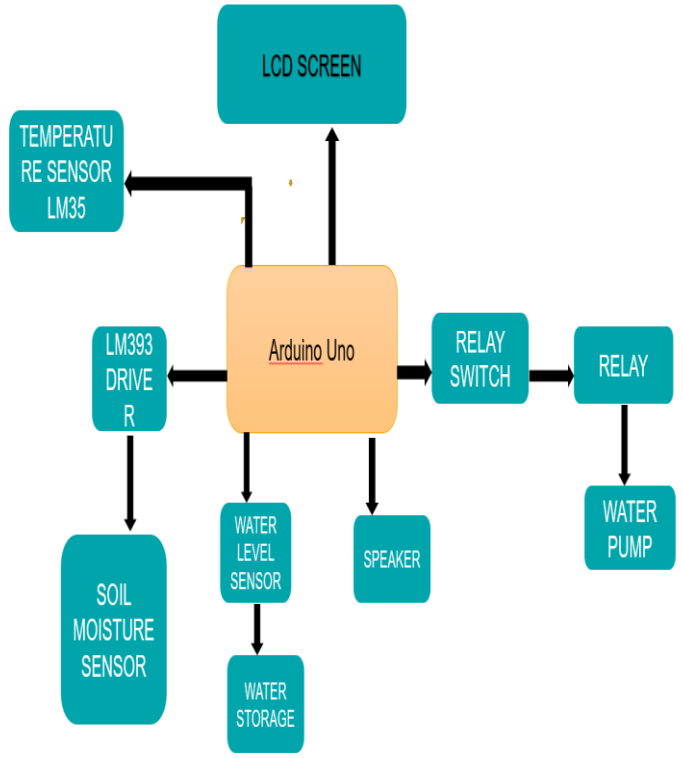
Inexpensive - Arduino boards are relatively inexpensive compared to other microcontroller platforms.

Cross-platform - The Arduino Software (IDE) runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited
to Windows.

Simple, clear programming environment - The Arduino Software (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well

3.BLOCK DIAGRAM

Figure shows architecture diagram of Automatic Irrigation System.



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4. CONCLUSION

The primary applications for this project are for farmers and gardeners who do not have enough time to water their crops/plants. It also covers those farmers who are wasteful of water during irrigation.

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 sensing make the commercial use of this technology possible to automate irrigation management for vegetable production. However, research indicates that different sensors types perform under all conditions with no negative impact on crop yields with reductions in water use range as high as 70% compared to traditional practices.

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