SMART 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: Raspberry pi, Fingerprint module, LCD

I. 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.

II. OBJECTIVE OF PROJECT

Overview of the system

There is an urgent need for a system that makes the agricultural process easier and burden free from the farmer's side. With the recent advancement of technology, it has become necessary to increase the annual crop production output entirely agro-centric economy. The ability to conserve the natural resources as well as giving a splendid boost to the production of the crops is one of the main aims of incorporating such technology into the agricultural domain of the country. To save farmers effort, water and time. 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.

III. PROPOSED SYSTEM

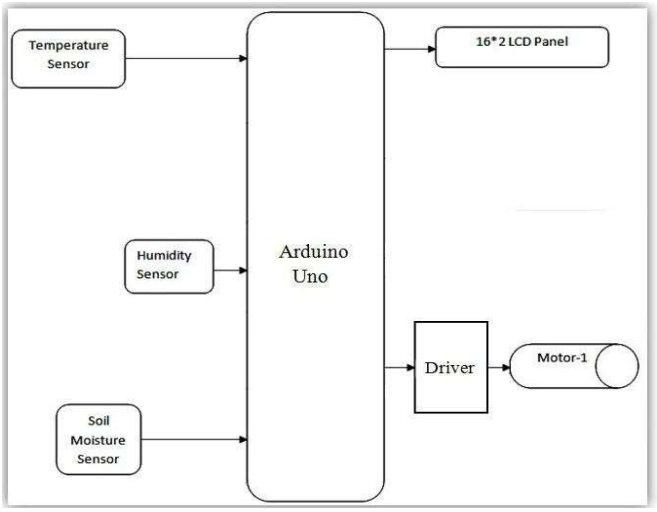
The voter ID card is replaced with which serves as an access to the individual on the day of voting. During the day of voting the voter undergoes a three-step verification process. The first step is one in wherein the voter has to show his card and it is read by a reader module. The reader module senses the card and displays the details of the individual on the LCD screen. Once after the details are displayed the voter is asked to place his/her registered finger on the fingerprint sensor. The sensor module verifies the fingerprint with the existing database and permits the user to next level of verification process if the details match else the LCD displays "wrong user". Once after the fingerprint matches, the camera turns on for the face recognition and captures the image of the person and matches it with the existing database. If the images also matches then the door of ballot booth opens for the voter to cast his vote and the votes are simultaneously on the monitor. Thus, this process provides a much secured three level verification process and the illegal practices during the day of voting are also avoided.

IV. LITERATURE SURVEY

It is a simple project more useful in watering plants automatically without any human interference. We know that people do not pour the water on to the plants in their gardens when they go to vacation or often forget to water plants. As a result, there is a chance to get the plants damaged. This project is an excellent solution for such kind of problems. Many irrigation systems exits such as, 1. Monitoring of rice crops using GPRS and wireless sensors for efficient use of water and Electricity. 2. Wireless Sensor Based Remote Monitoring System for Agriculture Using ZigBee and GPS. 3. Design of Embedded System for the Automation of Drip Irrigation. 4. A Survey of Automated GSM Based Irrigation System. 5. Wireless Sensor Networks Agriculture: For Potato Farming. 6. Design and Implementation of GSM based Irrigation System Using ARM7. 7. Automated Irrigation System Using a Wireless Sensor Network and GPRS Module. 8. Automated Irrigation System Using Solar Power. 9. Review for ARM based agriculture field monitoring system. 10. Automatic Irrigation Control by using wireless sensor networks. 11. Remote Sensing and Control of an Irrigation System Using a Distributed Wireless Sensor Network.

V. EXPERIMENTAL SETUP

BLOCK DAIGRAM:



Above is the manner in which we are going to implement the circuit. The first part of the block diagram are different sensors and the second part is an LCD Panel and motors for supplying water. The major hardware modules which are needed: Arduino processor, motor, different sensors and an LCD Panel.

1.Temperature Sensor (LM35):

The temperature sensor used to measure the temperature at the field is LM35. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade).The LM35 does not require any external calibration or trimming to provide typical accuracies of degree C at room temperature and degree C over a full -55 to +150C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35‟s low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. 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.

2. 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 This system relies on electrical capacitance, or the ability of two nearby electrical conductors to create an electrical field between

them. The sensor itself is composed of two metal plates with a non-conductive polymer film between them. The film collects moisture from the air, and the Moisture causes minute changes in the voltage between the two plates. The changes in voltage are converted into digital readings showing the amount of moisture in the air.

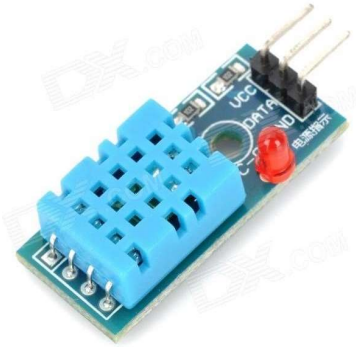


Fig. DHT11 Sensor

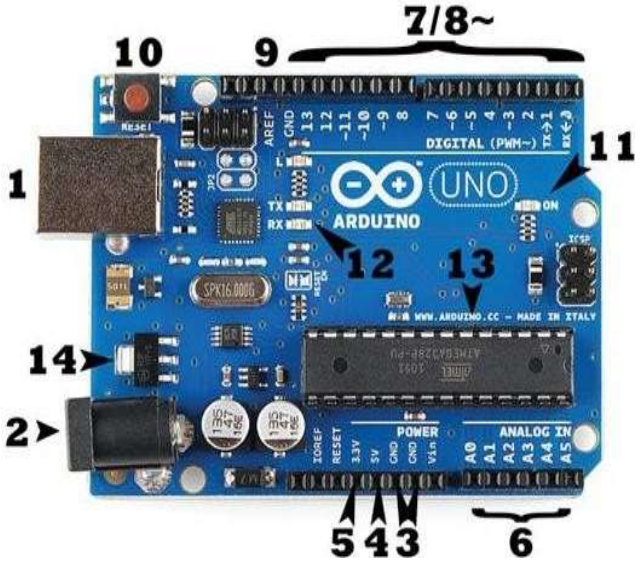
3.Soil Moisture Sensor:

Measuring soil moisture is very important in agriculture to help farmer for managing the irrigation system. Soil moisture sensor is one who solves this. This sensor measures the content of water. Soil moisture sensor uses the capacitance to measure the water content of soil. It is easy to use this sensor. Simply insert this rugged sensor into the soil to be tested, and the volumetric water content of the soil is reported in percent. Soil moisture sensors measure the volumetric water content in soil.

4. Arduino Micro-controller:

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

FEATURE	SPECIFICATION
Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by boot loader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

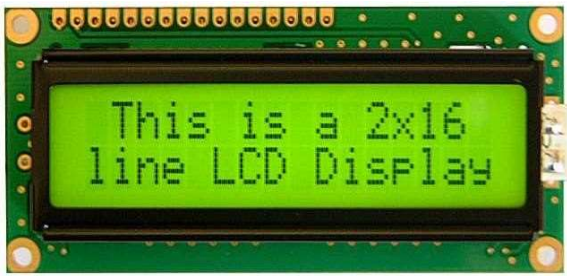


5. LCD Panel:

A liquid-crystal display (LCD) is a flat-panel display or other electronic visual display that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements. LCDs are used in a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays, and signage. They are common in consumer devices such as DVD players, gaming devices, clocks, watches, calculators, and telephones, and have replaced cathode ray tube (CRT) displays in nearly all applications.

Arduino

They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they do not suffer image burn-in. LCDs are, however, susceptible to image persistence.



6.Water Pump:

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.

7. 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.

8.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. This software can be used with any Arduino board. For latest software refer to link.
https://www.arduino.cc/en/Main/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 the Arduino 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.
- Open source and extensible hardware - The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it.
- Open source and extensible software - The Arduino software is published as open source tool and the language can be expanded through C++ libraries.

Advantages:

1) Relatively simple to design and install.
2) It is safest system and no manpower is required.
3) The system helps to farmer or gardener to work when irrigation is taking place, as only the area between the plants are wet.
4) Reduce soil erosion and nutrient leaching.
5) The system need smaller water sources, as it consumes less than half of the water.
6) Fertilizers can also be provided by using the system.
7) PH content of the soil is maintained Through the suggestions which helps for healthy plant growth.

VI. 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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