International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Automatic Irrigation System on Sensing Soil Moisture

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ABSTRACT –

In daily operations related to farming or gardening watering is the most important practice and the most labor-intensive task. No matter whichever weather it is, either too hot and dry or too cloudy and wet, you want to be able to control the amount of water that reaches your plants. Modern watering systems could be effectively used to water plants when they need it. But this manual process of watering requires two important aspects to be considered: when and how much to water. In order to replace manual activities and making gardener's work easier, we have create automatic plant watering system. By adding automated plant watering system to the garden or agricultural field, you will help all the plants reach their fullest potential as well as conserving water. Using sprinklers drip emitters, or a combination of both, we have design a system that is ideal for every plant in the yard.

***Key Words*: Arduino, Irrigation, Soil Moisture Sensor,Automated Irrigation Mechanism.**

1. INTRODUCTION

We all know that plants are very beneficial to all human beingsin many aspects. Plants helps in keeping the environment healthy by cleaning air naturally and producing oxygen. Many people love to have plants in their backyard. But due to civilization and insufficiency of place many people used to grow plants in a mold or dirt, pot, and placed on the windowsill. This plant is dependent on conventional breeding - watering and provide the right amount of sun to sustain life and growth.

In busy schedule of day-to-day life, many time people forget to water their plants and due to this plant suffers many disorders and ultimately died. In addition, the world's biggest problem inmodem society is the shortage of water resources, agriculture isa demanding job to consume large amounts of water. It is very essential to utilize the water resources in proper way.

Drip irrigation is a type of micro irrigation system that has the potential to save water and nutrients by allowing water to drip slowly to the roots of plants, either from above the soil surfaceor buried below the surface. The goal is to place water directlyinto the root zone and minimize evaporation.

Drip irrigation systems distribute water through a network ofvalves, pipes, tubing, and emitters.

Depending on how well designed, installed, maintained, and operated it is, a drip irrigation system can be more efficient than other types of irrigation systems, such as surface irrigation or sprinkler irrigation.

More cultivation with less water (65 to 75%) water saved, Less weeding (80%saved) than flood irrigation, Without labor can easily inject manure with farm watchman/representative, Fast growth with quality 80% labor's saved, Power saved.

2. IRRIGATION

Little water is lost to deep percolation if the proper amount is applied. Drip irrigation is popular because it can Irrigation system uses valves to turn irrigation ON and increase yields and decrease both water requirements and OFF. These valves may be easily automated by using labor. Controllers and solenoids. Automating farm or nursery Drip irrigation requires about half of the water needed by irrigation allows farmers to apply the right amount of sprinkler or surface irrigation. Lower operatingpressures water at the right time, regardless of the availability of and flow rates result in reduced energy costs.

A higher labor to turn valves on and off. In addition, farmers using degree of water control is attainable. Automation equipment are able to reduce runoff from over Plants can be supplied with more precise amounts of watering saturated soils, avoid irrigating at the wrong time water. Disease and insect damage is reduced because plant of day, which will improve crop performance by ensuring foliage stays dry. Operating cost is usually reduced. Adequate water and nutrients when needed. Automatic Federations may continue during the irrigation process Drip Irrigation is a valuable tool for accurate soil moisture because rows between plants remain dry. The capacity of soil to retain water is a function of soil texture and structure. When removing a soil sample, the soil being evaluated is disturbed, so its water-holding capacity is altered. Indirect methods of measuring soil water are helpful as they allow information to be collected at the same location for many observations without disturbing the soil water system. Content without any need for soil density determination. The new soil moisture sensor uses Immersion Gold which protects he nickel from oxidation. Electrodes nickel immersion Fig. 1 Overview of Automated Irrigation System gold (ENIG) has several advantages over more conventional (and cheaper) surface plating such as The above fig 1 explains about important parameters to be HASL (solder), including excellent surface planarity measured for automation of irrigation system are soil (particularly helpful for PCB's with large BGA packages), moisture. The entire field is first divided into small good oxidation resistance, and usability for untreated sections such that each section should contain one contact surfaces such as membrane switches and contact moisture sensor. These sensors are buried in the ground at points required depth. Once the soil has reached desired moisture a soil moisture sensor can read the amount of level the sensors send a signal to the micro controller to moisture present in the soil surrounding it. It's a low tech turn on the relays, which control the motor. Sensor but ideal for monitoring an urban garden, or your .In proposed system, automated irrigation pet plant's water level. This is a must have tool for a mechanism which turns the pumping motor ON and OFF connected garden. On detecting the dampness content of the earth. In this sensor uses the two probes to pass current through domain of farming, utilization of appropriate means of the soil, and then it reads that resistance to get the irrigation is significant. The benefit of employing moisture level. More water makes the soil conduct these techniques is to decrease human interference. Electricity more easily (less resistance), while dry soil this automated irrigation project, the soil sensor senses conducts electricity poorly (more resistance). The moisture content by giving input signal to an Arduino board which operates on ATmega328 micro-controller, is programmed to collect the input signal of changeable dampness circumstances of the earth via dampness detecting system. Because this method is based on ultimately profit. , it is the standard with which all other methods are compared.

SOIL MOISTURE

Soil moisture is an important component in the Atmospheric water cycle, both on a small agricultural scale and in large- scale modelling of land/atmosphere interaction. Vegetation and crops always depend more on the moisture available at root level than on precipitation occurrence. Water budgeting for irrigation planning, as well as the actual scheduling of Irrigation action, requires local soil moisture information. Knowledge of the degree of soil wetness helps to forecast the risk of flash floods, or the occurrence of fog. Fig. 2 Block diagram of the system Soil water content is an expression of the mass or volume. The above fig 2 shows Microcontroller based irrigation of water in the soil, while the soil water potential is a system proves to be a real time feedback control system expression of the soil water energy status. The relation which monitors and controls all the activities of drip between content and potential is not universal and depends irrigation system efficiently. The present proposal is a on the characteristics of the local soil, such as soil density model to modernize the agriculture industries on a small and soil texture. Scale with optimum expenditure. Using this system, one the basic technique for measuring soil water content is the can save manpower, water to improve production and gravimetric method. Because this method is based on ultimately profit. Direct measurements, it is the standard with which all other methods are compared.

Block diagram

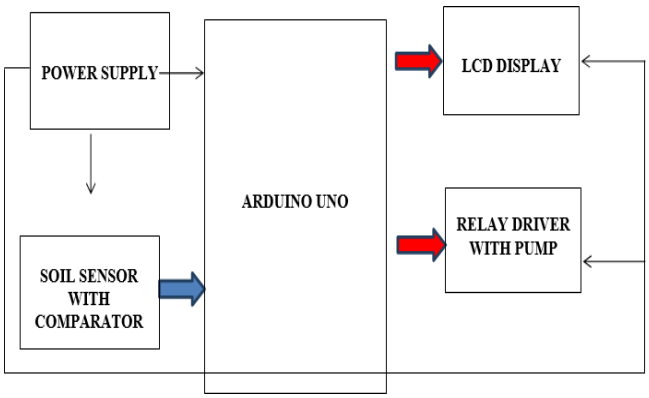


Fig.01. Block Diagram.

Power Supply: It supplies + 12 VDC power to relaymodule, & +5 VDC power to Soil sensor module, Arduino UNO Board.

Arduino UNO: The Arduino Uno is an open-source microcontroller board. The board is equipped with setsof digital and analog input/output (I/O) pins. Thiscontroller is used to interface in between Sensor Module, Relay Module & LCD.

Soil Sensor module with Comparator: Soil moisture sensor module is used to detect the moisture of the soil. It measures the volumetric content of water inside the soil and gives us the moisture level as output.

Relay Driver Module: It used to convert low power DC switching output of Arduino board into a high-power mains AC switching output to drive a load like fan, motor.

LCD Display: It is 16 X 2 LCD display is very basic module and is commonly used in various devices and circuits to displaythe output.

SOIL MOISTURE SENSOR

The Soil moisture sensor unit consists of soil moisture sensor And LM393 comparator chip. The soil moisture sensor is used to detect the soil moisture. The soil probe is dip in to the soil such that when the soil moisture is LOW the module output is HIGH indicated by using RED led on the comparator chip. This sensor measures the dielectric constant of the soil by using Transmission line techniques. This circuit consists of four pins Such as power supply pin, ground pin, analog and digital pins. The analog pin A0 connected to the analog pin of ARDUINO Board and digital D0 pin connected to the digital pin of ARDUINO board. This sensor is a dual output mode in which Analog output is more accurate. The operating voltage is up to5V.

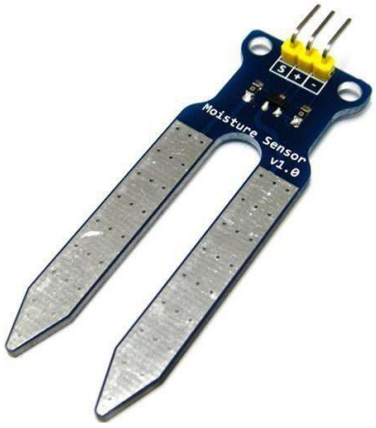


Fig.02. Soil Moisture Sensor

RELAY DRIVER WITH MOTER / FAN

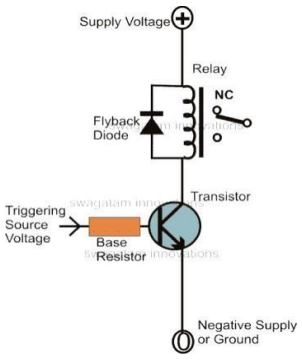


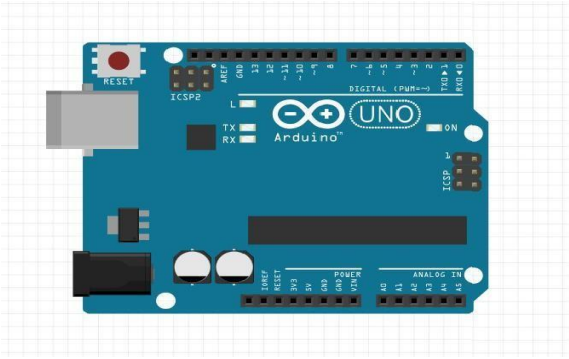
Fig 03: Relay driver circuit

An electronic circuit will normally need a relay driver using a transistor circuit stage to convert its low power DC switching output into a high-power mains AC switching output.

However, the low-level signals from an electronic which may be derived from an IC stage or allow current transistor stage may bePretty incapable of driving a relay directly. Because a relay requires relatively higher currents which may be normally not available from an IC source or a low current transistor stage.
To overcome the above issue, a relay control stage becomes imperative for all electronic circuits which need this service.A relay driver is nothing, but an additional transistor stage attached with the relay which needs to be operated. The transistor is typically and solely employed for operating the relay in response to the commands received from the preceding controlstage.Referring to the above circuit diagram we see that the configuration only involves a transistor, a base resistor, and the relay with a fly back diode.However, there are a few complexities that need to be settled before the design could be used for the required functions:Since the base drive voltage to transistor is the major source for controlling the relay operations, it needs to be perfectly calculated for optimal results.The base resistor value id directly proportional to the current across the collector/emitter leads of the transistor or in other words, the relay coil current, which is the collector load of the transistor, becomes one of the main factors, and directly influences the value of the base resistor of the transistor.

ARDUINO UNO BOARD

The Arduino Uno is an open-source microcontroller board based on the Microchip ARmega328p microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may ne interfaced to various expansion boards (shields) and other circuits.The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a



type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.The word "UNO" means "one" in Italian and was chosen to mark the initial release of Arduino Software. The Uno board is the first in a series of USB-based Arduino boards and version 1.0 of the Arduino. IDE were the reference version of Arduino, which have now evolved to newer releases. The ATmega328 on the board comes pre-programmed with a boot loader that allows uploadingnew code to it without the use of an external hardware programmer.

Fig. 04: Arduino UNO Board

ARDUINO UNO PIN DETAILS

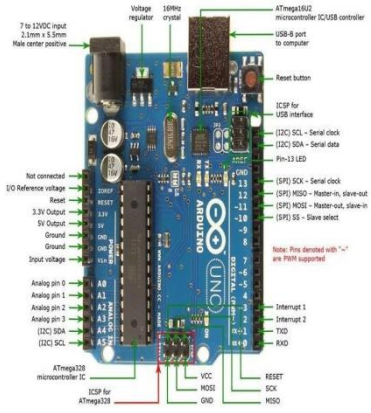


Fig. 05: Pin diagram of Arduino UNO

5 V and 3.3 V: It provides regulated 5 V and 3.3 V to external components according to manufacturer specifications.

GND: The GND pins are used to close the electrical circuit andprovide a common logicreference level throughout your circuit.

RESET - Resets the Arduino.

IOREF - This pin is the input/output reference. It provides the voltage reference with which the microcontroller operates.

Arduino Uno Pin out – Analog IN: The Arduino Uno has 6 analog pins, which utilize ADC (Analog to Digital converter). These pins serve as analog inputs but can also function as digitalinputs or digital outputs.

Analog to Digital Conversion: ADC stands for Analog to Digital Converter. ADC is an electronic circuit used to convert analog signals into digital signals. This digital representation of analog signals allows the processor to measure the analog signal and use it through its operation. Arduino Pins A0-A5 are capable of reading analog voltages. On Arduino the ADC has 10-bit resolution, means it can represent analog voltage by 1,024 digital levels. The ADC converts voltage into bits which the microprocessor can understand.

Arduino Uno Pin out - Digital Pins: Pins 0-13 of the Arduino Uno serve as digital input/output pins. Pin 13 of the Arduino Uno is connected to the built-in LED. In the Arduino Uno - pins 3, 5, 6, 9, 10, 11 have PWM capability. It's important to note that each pin can provide/sink up to 40 mA max. But the Recommended current is 20 mA. The absolute max currentprovided (or sank) from all pins together is 200 mA.

Aref - Reference voltage for the analog inputs.

Interrupt - INT0 and INT1. Arduino Uno has two external interrupt pins INT0 and INT1 are mapped to pins 2 and 3. In contrast, pin change interrupts can be activated on any of the pins.

External Interrupt - An external interrupt is a system interrupt that occurs when outside interference is present. Interference can come from the user or other hardware devices in the network. Common uses for these interrupts in Arduino are reading the frequency a square wave generated by encoders or waking up theprocessor upon an external event.

Arduino Uno Pin out - ICSP Header: ICSP stands for In- Circuit Serial Programming. The name originated from In- System Programming headers (ISP).Manufacturers like Atmel who work with Arduino have developed their own in- circuit serial programming headers.

LM 393 based Soil Sensor Module

Soil moisture sensor moduleis used to detect the moisture of the soil. It measures the volumetric content of water inside the soil and gives us the moisture level as output. The module has both digital and analog outputs and a potentiometer to adjust thethreshold level.
This Moisture sensor module consists of a Moisture sensor, Resistors, Capacitor, Potentiometer, Comparator LM393 IC, Power and Status LED in an integrated circuit.

Moisture Sensor Module Pinout Configuration

Pin Name	Description
V_{CC}	The V_{CC} pin powers the module,typically with +5V.
GND	Power Supply Ground
D_O	Digital Out Pin for Digital Output.
A_O	Analog Out Pin for Analog Output

LM 393 IC

LM 393 Comparator IC is used as a voltage comparator in this Moisture sensor module. Pin 2of LM 393 is connected to Preset (10KΩ Pot) while pin 3 is connected to Moisture sensor pin. The comparator IC will compare the threshold voltage set using the preset (pin2) and the sensor pin (pin3).

LM 393 IC Pin Configuration is given below:

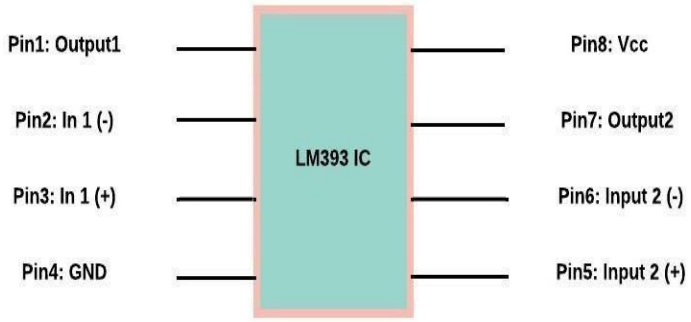
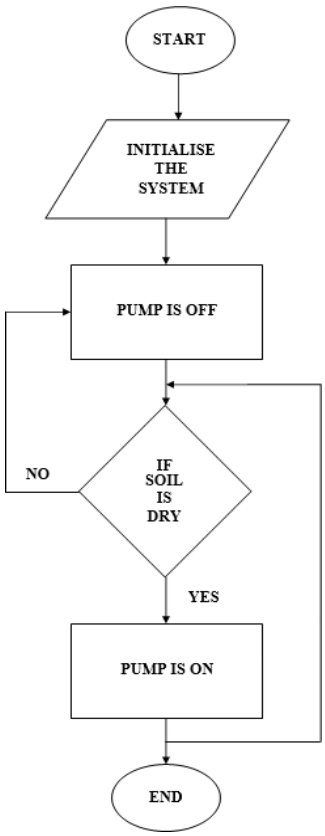


Fig 06: Pin Diagram of IC LM393

System Flow Chart



RESULT

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 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.

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. 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.

Require amount of water is preciously provided to the crop (i.e., soil) & hence the wastage of water is avoided.
The equipment is itself is low cost & reliable.Reduce use of natural resources
Dependency on rainfall can be avoided.
Farmers get all the information about their farmAnd can interact with drip from their mobile Devices.
The developed system can also transfer Fertilizer and the other agricultural chemicals

Calcium, sodium, ammonium, zinc) to theField with adding new sensors and valves.
The smart drip system can be used in commercial asWell as agricultural use.
Centralized database maintenance of cropsAccording to the atmospheric condition Throughout the year.
Can control more parameters more precisely

Reference

https://electronicsforu.com/electronics- projects/automatic-drip-irrigation-system

https://www.slideshare.net/SnehalHedau1/sneha- hedau

http://www.mjret.in/V4I1/M1-4-1-1-2017.pdf http://www.alldatasheet.com/