AUTOMATED PLANT WATERING SYSTEM USING ARDUINO

M.PUJITHA (R191019)

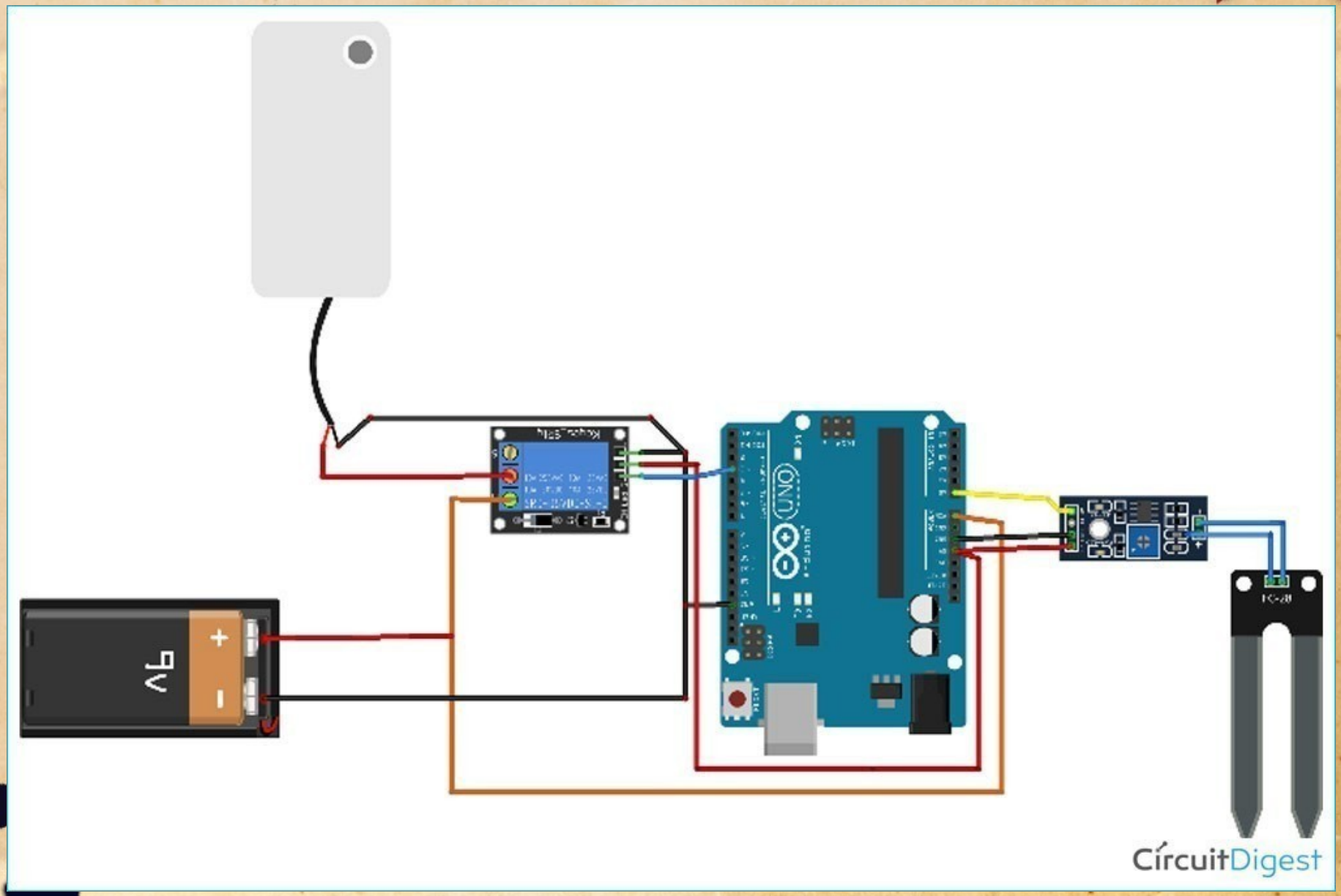
INTRODUCTION

* To Agriculture is the important construction of critical food crop. Agriculture is represent as manufacture, dispensation, encouragement and division rural products

* Its high time to create and implement new methodologies using smart technologies for sustainable agriculture

* This project automatically turns ON or OFF by detecting the water content in the soil.

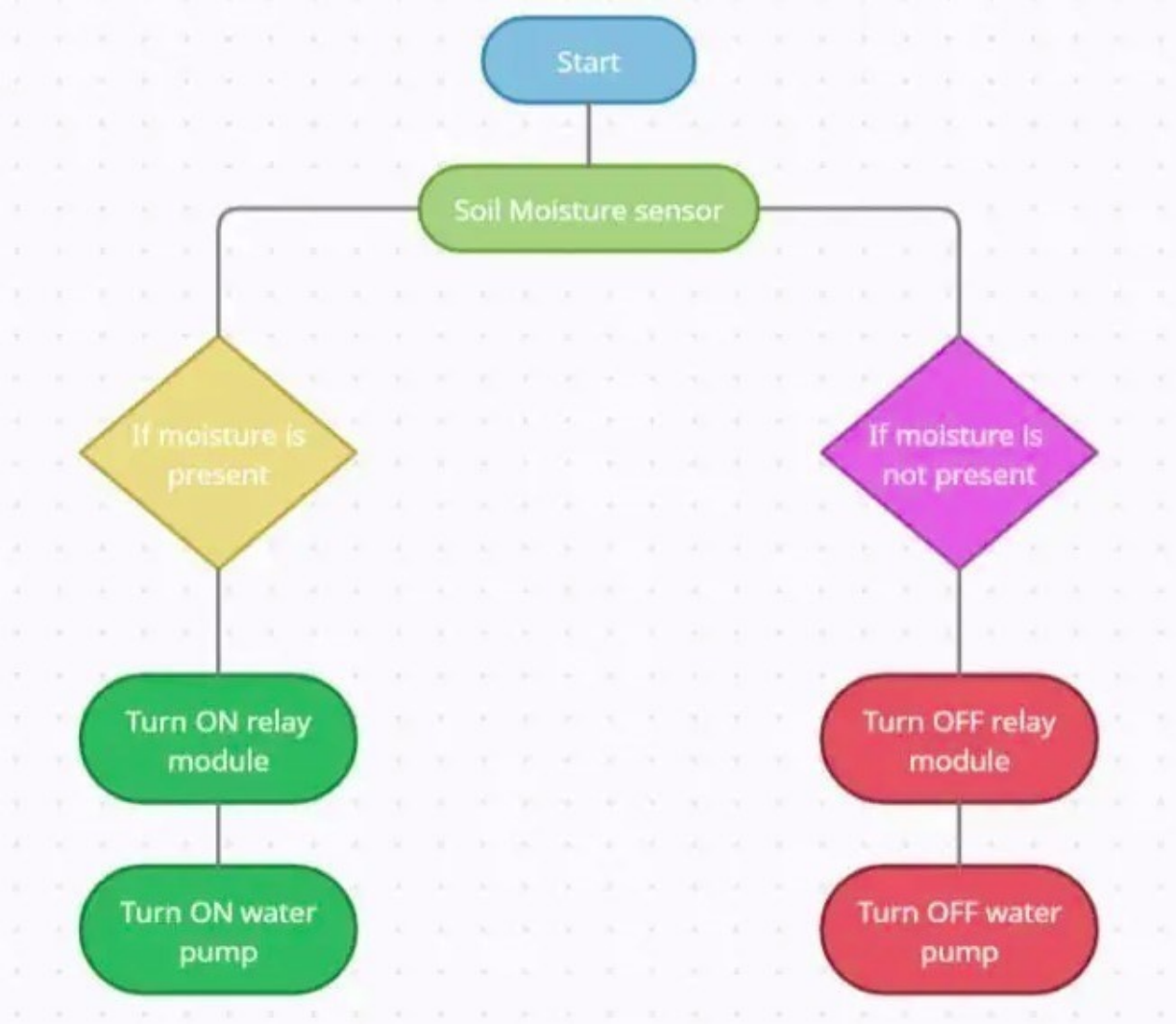
BASIC CIRCUIT DIAGRAM



SOFTWARE & HARDWARE REQUIREMENTS

- Arduino IDE
- Power supply (9 volts battery)
- Arduino Microcontroller
- Water pump Motor and small tub
- Relay Module
- Soil Moisture Sensor
- Jumper wires

FLOWCHART


Start
Soil Moisture sensor
If moisture is present
If moisture is not present
Turn ON relay module
Turn OFF relay module
Turn ON water pump
Turn OFF water pump

DESCRIPTION

Arduino UNO:

- The Arduino is a microcontroller board. It is used to operate a Sensors, LCD, Bluetooth and also storage devices.

Microcontroller UNO

Operating Voltage 5V

- Input/output pins

Digital 0-13 (6 pins are PWM pins) PWM: 3, 5, 6, 9, 10, and 11.

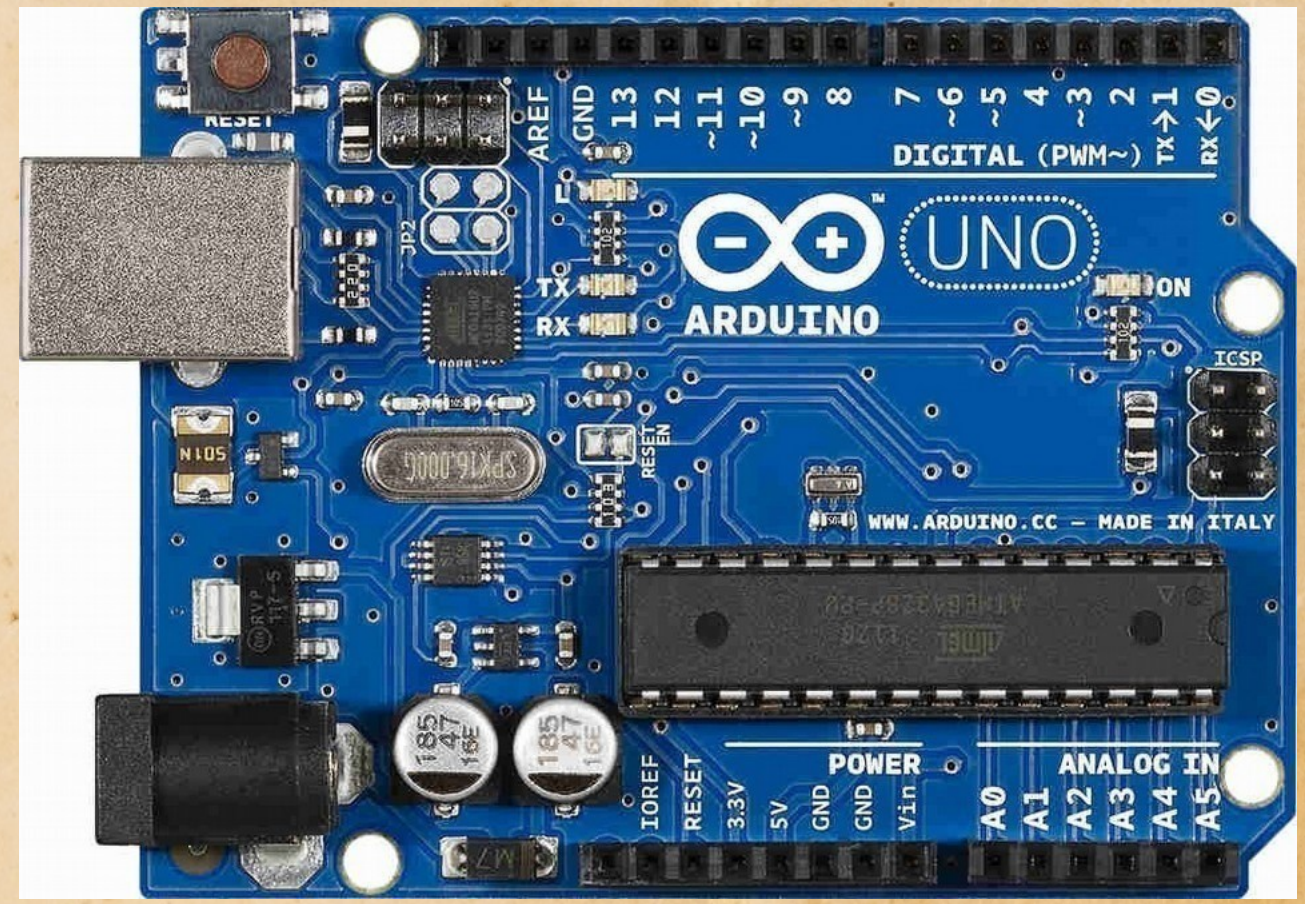
Analog 0-5v

- It comes with an open supply hardware feature that permits users to develop their own kit

DESCRIPTION

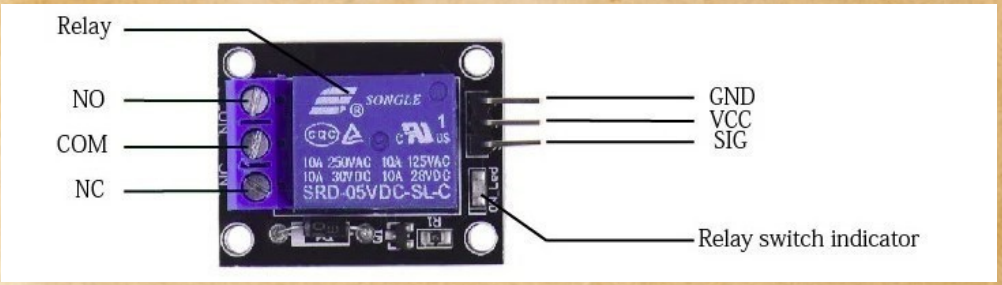
- Arduino UNO:
- Arduino UNO is the best startup board with electronics and code. UNO is the most widely used and writtenboard for the entire Arduino family.
- Arduino Uno is a small control board based on ATmega328P. It has 14 digital input / output pins (6 of which can be used as PWM effects).
- 6 analog inputs, 16 MHz quartz crystal, USB connection, power jug, ICSP header and reset button .
- It contains everything needed to support a small controller.

DESCRIPTION



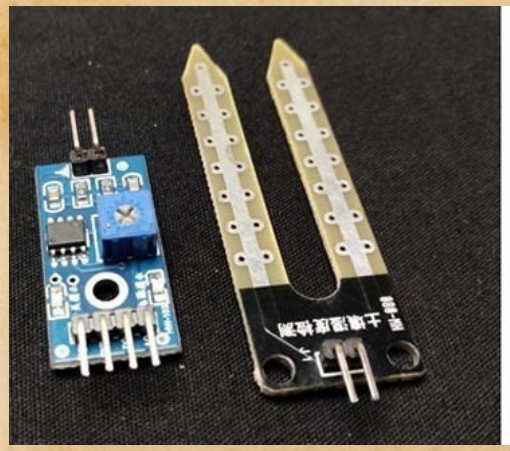
DESCRIPTION

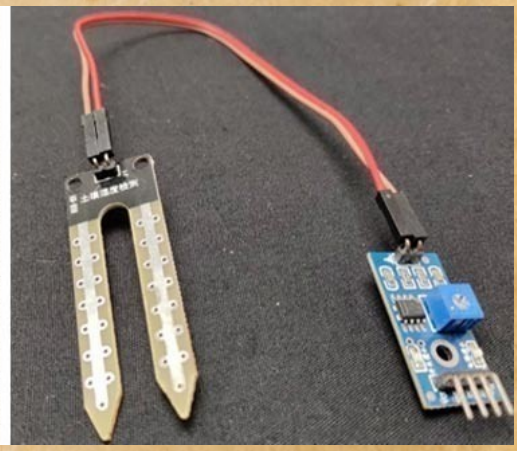
- Relay module:
- Relay modules (or power transfer modules) are electronic components that are ubiquitous.
- They are a ver important part of any home automation project.
- You will need a transmission module if you are using a low voltage controller. In fact, they work as switches.



DESCRIPTION

- Soil Moisture Sensor :
- The working of the soil moisture sensor is very easy to understand.
- It has 2 probes with exposed contacts that act like a variable resistor whose resistance varies according to the water content in the soil. This resistance is inversely proportional to the soil moisture which means that higher water in the soil means better conductivity and hence a lower resistance.





Water pump motor

- We need a small pump to irrigate the plant, but in the case of a garden
- we need to drive a larger pump that can provide a higher volume of water depending on the size of your garden which can’t be directly powered by an Arduino. So in case you need to operate a larger pump, a driver is necessary to provide enough current for the pump, to show that I am using a 5v relay. You can also use an AC-powered pump and use a suitable relay. The working will remain the same as shown in this project, you just have to replace the DC power
- input connected to the relay with an AC power input and have to power your Arduino with a
- separate DC power source.
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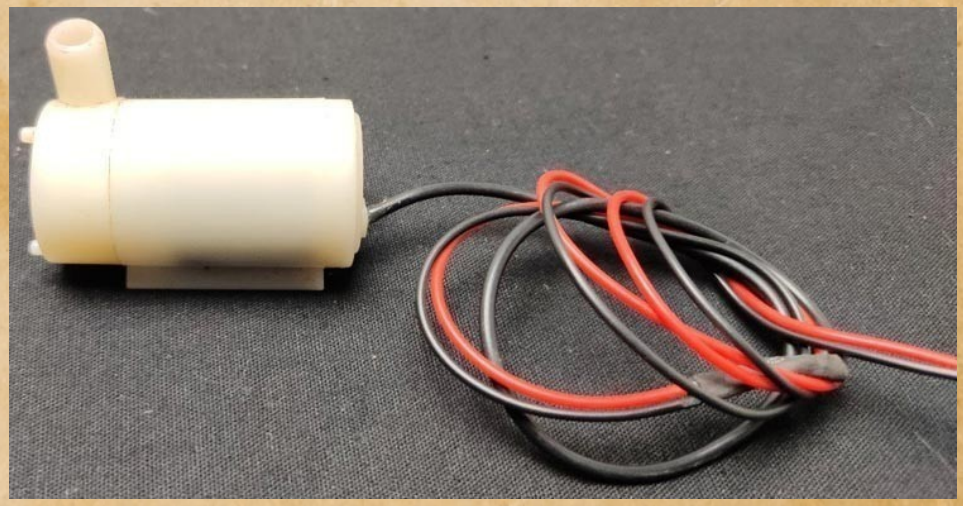
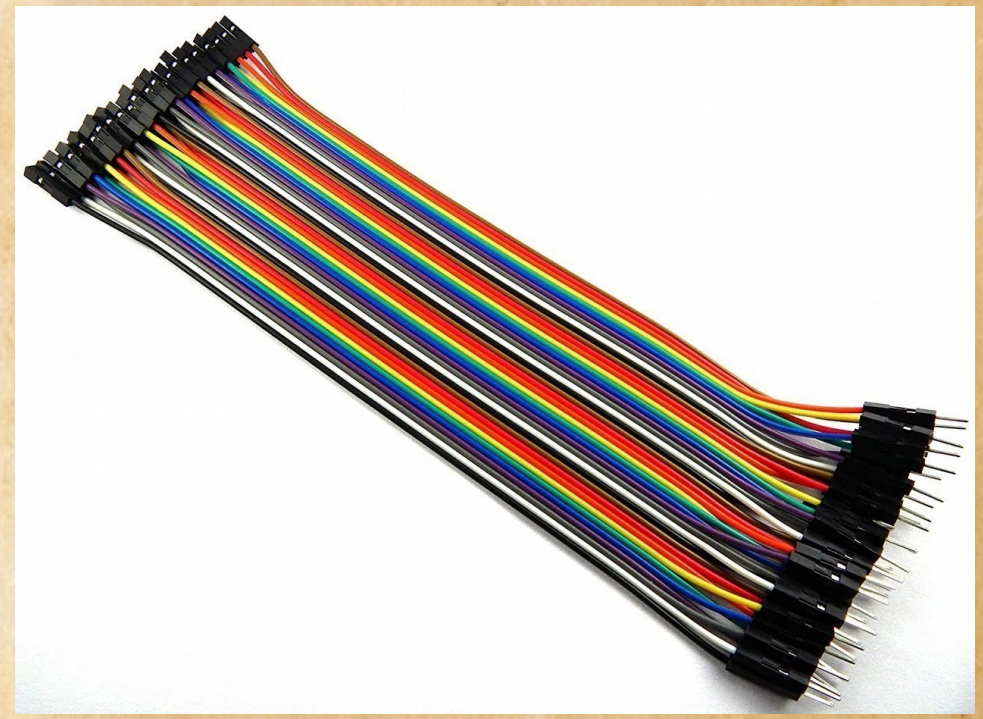


Jumper Wires :

- A jump wire (also known as jumper, jumper wire, DuPont wire) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a bread board or other prototype or test circuit, internally or with other equipment or components,



- **The wire colour is just an aid to help you keep track of what is connected to which. It will not affect the operation of the circuit. This means that a red jumper wire is technically the same as the black one. Even so, the colours can be used to your advantage to differentiate the types of connections. For instance, red as ground and black as power. Literally, what works for you.**

Power Supply :

- The nine-volt battery, or 9-volt battery, is an electric battery that supplies a nominal voltage of 9 volts.
- The nine-volt PP3-size battery is commonly available in primary zinc carbon and alkaline chemistry, in primary lithium iron disulfide and lithium manganese dioxide (sometimes designated CRV9), and in rechargeable form in nickel Cadmium (Ni–Cd), nickel- metal hydride (Ni–MH) and lithium ion.Mercury batteries of this format, once common, have been banned in many countries due to their toxicity.
- Designations for this format include NEDA 1604 and IEC 6F22 (for zinc-carbon) or MN1604 6LR61 (for alkaline). The size, regardless of chemistry, is commonly designated PP3—a designation originally reserved solely for carbon-zinc, or in some countries, E or E-block.
- A range of PP batteries was produced in the past, with voltages of 4.5, 6, and 9 volts and different capacities; the larger 9- volt PP6, PP7, and PP9 are still available. A few other 9-volt battery sizes are available: A10 and A29.

ABOUT CONNECTED COMPONENTS

- Take a soil moisture sensor and connect its VCC pin to the 5V pin of the Arduino UNO

Board.

Connect the GND pin of the sensor to the GND pin of the Arduino UNO board.

Connect the analog data pin of the sensor to the A0 pin of the Arduino UNO board.

Now, take a 5V relay module and take a 9V battery.

Connect the positive wire of the battery to the COM terminal of the relay module.

Take a water pump and connect the positive wire of the water pump to the NO pin of the

relay module.

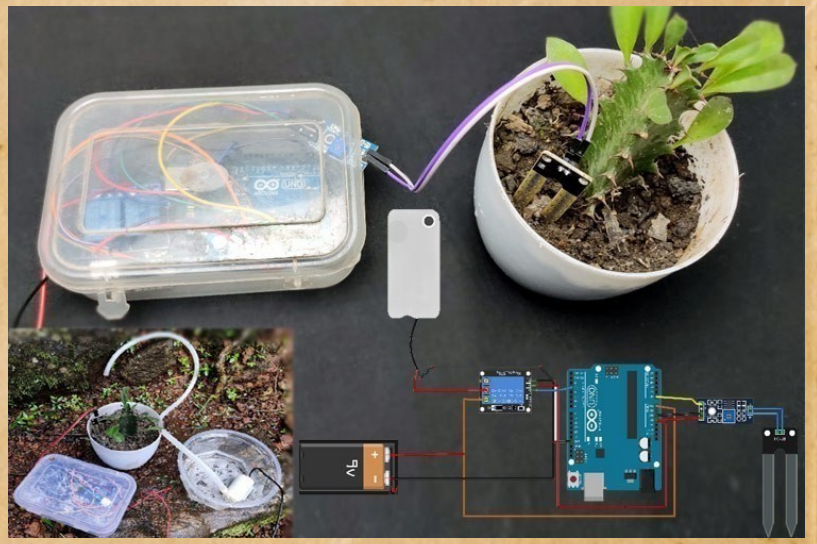
Connect the negative wire of the battery to the negative wire of the motor.

Connect the VCC pin of the relay module to the 5V pin of the Arduino UNO board.

Connect the GND pin of the relay module to the GND pin of the Arduino UNO board.

In the last connect the signal pin of the relay module to the D3 pin of the Arduino UNO

board.



CIRCUIT DESCRIPTION

DESIGN ALGORITHM :

- The Soil Moisture Sensor values depends on the resistance of the soil. The LM393 Driver is a dual differential comparator which compares the sensor voltage with fixed 5V supply voltage .
- The LM35 is a precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius temperature. The LM35 is operates at -55˚to +120℃.
- The Water level Switch Contains a Reed-Magnetic Switch surrounded by a floating magnet. When water is available it Conducts.
- The Arduino reads the status of the soil using Soil Moisture Sensor. If the Soil is DRY it does the following Operations....

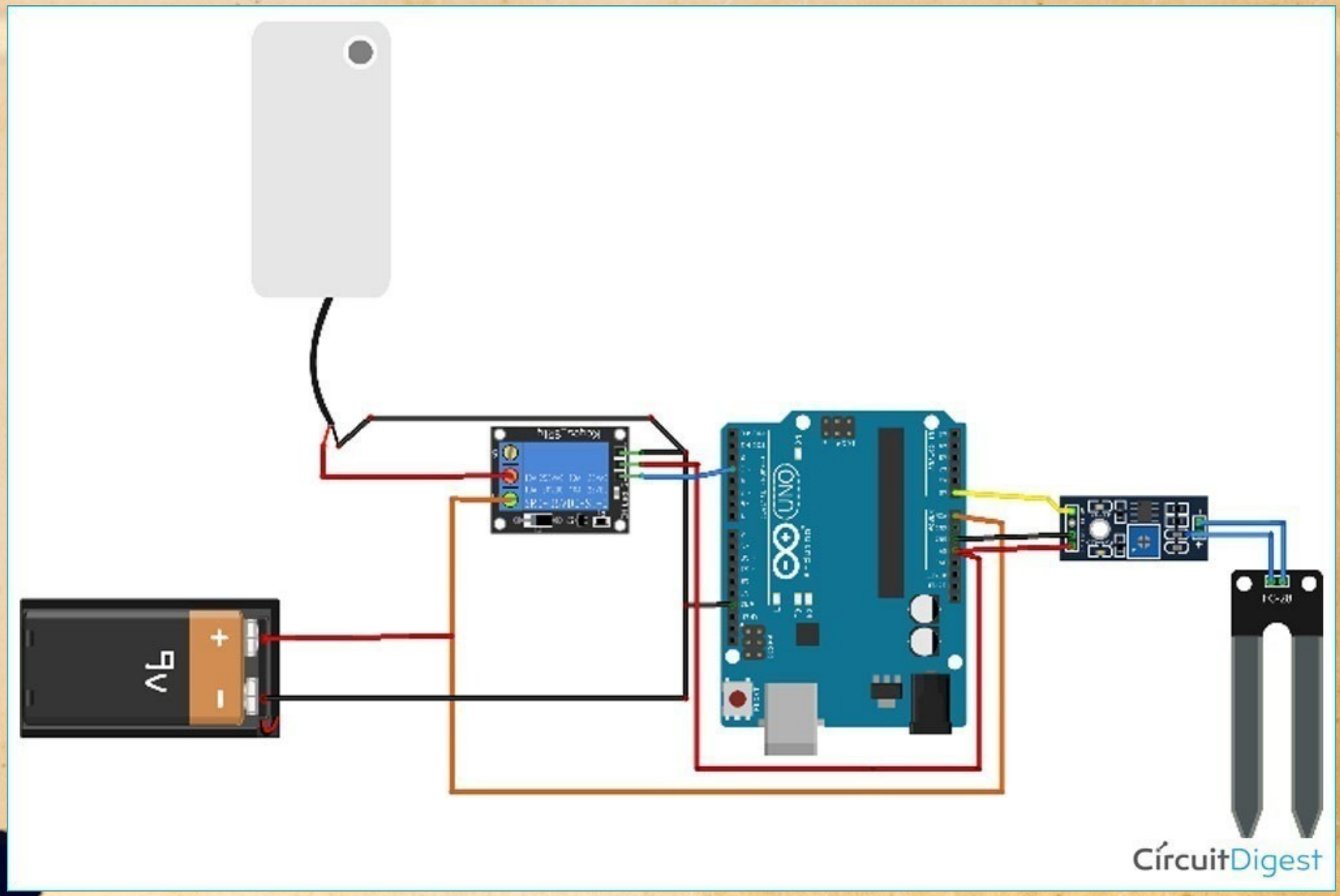
  1) Checks for the availability of water using water level sensor.

  2) If the water is available, the Pump is turned ON and is automatically turned OFF when sufficient amount of water is supplied.

  The Pump is Driven by a Relay driver circuit.

  3) If the Water is Unavailable, you will be notified with a sound.

Circuit Diagram



PROGRAMMING CODE :

```
int water; //random variable
void setup() {
pinMode(3,OUTPUT); //output pin for relay board, this will sent signal to the relay
pinMode(6,INPUT); //input pin coming from soil sensor
}
void loop() {
water = digitalRead(6); // reading the coming signal from the soil sensor
if(water == HIGH) // if water level is full then cut the relay
{
```

•

```
{
digitalWrite(3,LOW); // low is to cut the relay
}
Else
{
digitalWrite(3,HIGH); //high to continue proving signal and water supply
14}
delay(400);
}
```

MERITS :

➨One of the greatest advantages of a smart irrigation system is its ability to save water.

➨ Generally speaking, traditional watering methods can waste as much as 50% of the water used due to inefficiencies in irrigation, evaporation and overwatering. Smart irrigation systems use sensors for real-time or historical data to inform watering routines and modify watering schedules to improve efficiency.

➨ There are two important aspects of smart irrigation: control types -- the way the irrigation is controlled -- and delivery types -- the type of water delivery systems used.

➨There are also two basic types of control for smart irrigation systems, weather-based and soil-based, each varying in its technical method of sensing and supplying information.

DEMERITS :

+ It requires initial evaluation of site specific conditions before selection of appropriate moisture sensor.

➨ It requires probe to be inserted in the soil. It requires labor to collect the data and maintain the measurement processes.

➨ The measured values depend on properties of various materials. The correct interpretation and use of moisture data is needed.

➨ Watermark sensors provide less accuracy in sandy soils due to large particles.

➨ Watermark sensors are required to be calibrated for each soil types. Tensiometers also require periodic service.

RESULT :

- *The smart irrigation system was tested on a garden plant. The plant's water requirement is 600-800mm a day and temperature requirement of the soil ranges from 50oC- 100oC. In the Arduino code, the moisture and temperature range were set as 300-700 and 450-800 respectively (which delineates the corresponding resistance value in digital format). Moreover this system proves to be cost effective and proficient in conserving water and reducing its wastage.*
- *When watering a plant manually by assuming the approximate quantity without using sensor based technique and when using the automatic irrigation system based on arduino. Byanalysing fig.4 it can be concluded*
- *that the traditional method of watering plants consumes more water than its required for good yield of a plant and hence water wastage is performed.*
- *On the other hand by using arduino project for irrigating plants right amount of water is provided by*
- *calculating moisture content of plant soil therefore no water wastage at all. Based on the moisture of the soil,*
- *water will be sprinkled to the field thus the effective utilization of water is performed. Also, the smart*
- *Irigation system overcomes the tedious process in manual irrigation system and also prevents soil*
- *erosion and nutrient runoff due to excessive water flow in field*

THANKYOU