ARDUINO PROJECT

An Mini Project submitted in partial fulfillment of the requirement for the award of the Degree of

BACHELOR OF TECHNOLOGY

In

ELECTRONICS AND COMMUNICATION ENGINEERING

By

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GAYATRI VIDYA PARISHAD COLLEGE OF ENGINEERING FOR WOMEN
MADHURAWADA, VISAKHAPATNAM-48
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(Accredited by NBA for B.Tech-CSE, ECE and IT -valid from 2019-22 and 2022-25)

(2020-2024)

VISION & MISSION

Vision of the Institute

To emerge as an acclaimed centre of learning that provides value-based technical education for the holistic development of students

Mission of the Institute

- Undertake the activities that provide value-based knowledge in Science, Engineering, and Technology
- Provide opportunities for learning through industry-institute interaction on the state-of-the-art technologies
- Create a collaborative environment for research, innovation, and entrepreneurship
- Promote activities that bring in a sense of social responsibility

Vision of the Department

Produce competitive engineers instilled with ethical and social responsibilities to deal with the technological challenges in the field of Electronics & Communication Engineering.

Mission of the Department

- Facilitate a value-based educational environment that provides updated technical knowledge
- Provide opportunities for developing creative, innovative and leadership skills
- Imbue technological and managerial capabilities for a successful career and lifelong learning

PROJECT TITLE: Automatic Plant Watering System

INTRODUCTION:

The greatest crisis in modern day and age is a great disparity in the agricultural sector turnover. The great losses incurred in agriculture: material losses or financial losses most of them are attributed to crop health and quality. If the crops are determined to be not up to par, this may result in a loss. In order to prevent this, we need to maintain the quality of crops and keep them at maximum health. On a practical basis, this is nearly impossible for a farmer who has large lands to observe and maintain. However, this is currently being managed manually. There is a danger in this; many of the laborers are preferring to work at white collar jobs, and as a result, there is a large deficiency in manpower. This makes automated farming a necessary part of the future. The greatest cause for the crops being not on par is improper irrigation (other than natural calamities). If the irrigation issues are resolved, most of the problem is solved. Hence this is the pinnacle point that needs to be renovated with technology. Automating this part of the process will be extremely beneficial to farmers. The automated plant irrigation system will help to reduce the work load on farmers, and help to keep the farm lands well irrigated at all times. Most of the farmers all over the world suffer to maintain their crops with proper watering methods, but find themselves helpless. This system will help farmers irrigate their lands even single- handedly, without the need of additional manpower. Its user friendly simple circuitry will make the user feel comfortable in using this system. The user only needs to install the circuit and sensors and connect the pump to the circuit and its complete. The system will start functioning upon power-up, and will need no trigger to keep it running.

PROJECT AIM:

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. Our country mostly depends on agriculture. The farmers working in the farm lands are solely dependent on the rains and bore wells for irrigation of the land. Even if the farm land has a water-pump, manual intervention by farmers is required to turn the pump on/off whenever needed.

The project aim is to detect the dryness in soil using sensors and provide water to the plants appropriately. This project helps to maintain the plants quite easily. In this project we are detecting soil moisture and need for Irrigation.

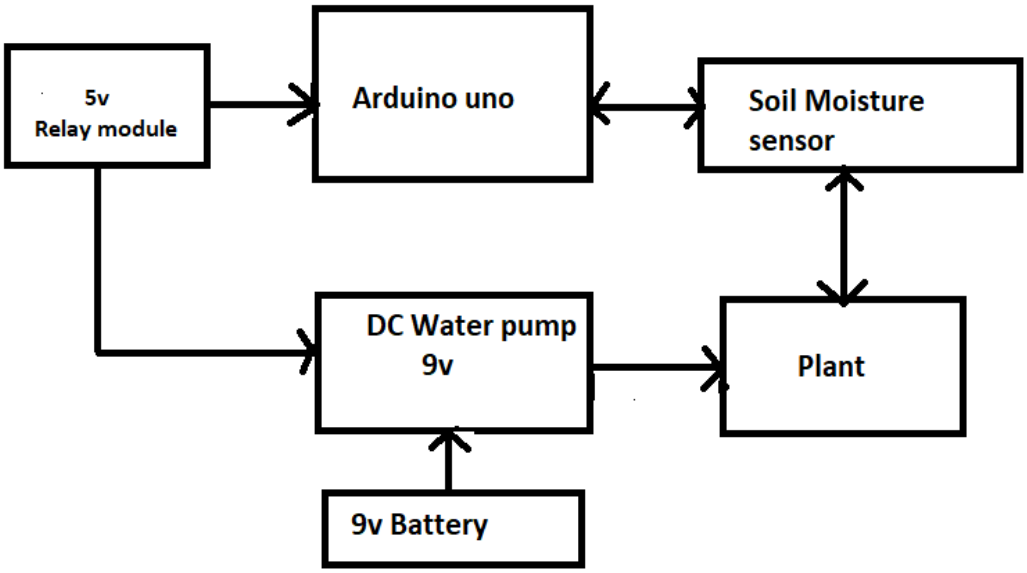
The Aim of our project is to minimize this manual intervention by the farmer.

Automated Irrigation system will serve the following purposes:

1) As there is no un-planned usage of water, a lot of water is saved from being wasted.

2) The irrigation is done only when there is not enough moisture in the soil and the sensors decide when the pump should be turned on/off. This saves a lot time for the farmers. This also gives much needed rest to the farmers, as they don’t have to go and turn the pump on/off manually.

BLOCK DIAGRAM :



DESIGN REQUIREMENTS:

HARDWARE COMPONENTS:

1) Arduino UNO

2) 5volts Relay Module

3) Soil Moisture Sensor

4) DC Water pump and pipe

5) Jumper wires

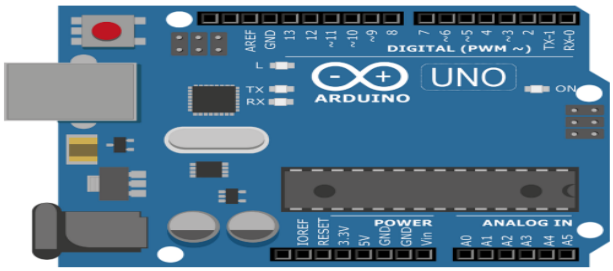
6) USB –A to B cable

7)9v Battery

SOFTWARE: Arduino IDE

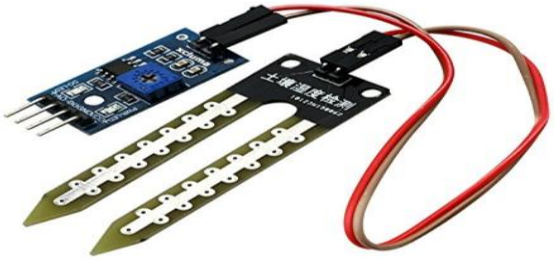
HARDWARE COMPONENTS:

1.Arduino Uno: The Arduino UNO is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button. It is the most 1 popular and widely used board among the Arduino boards. The Arduino UNO can be programmed using the Arduino programming language.



2. Soil Moisture Sensor: Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.

The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.



3. 5volts Relay Module: A 5V relay module is a single or multi-channel relay module that works with a low-level trigger voltage of 5V DC. The input voltage can be from any microcontroller or logic chip that outputs a digital signal.It is actually an "automatic switch" that uses a smaller current to control a larger current. Relay plays the role of automatic adjustment, safety protection, and conversion circuit in the circuit.

4) DC Water pump and pipe: A DC motor is any of a class of rotary electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor. DC motors were the first type widely used, since they could be powered from existing directcurrent lighting power distribution systems.

A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. A DC motor pump is essentially a DC Motor that is used to circulate water. The internal structure is the same. The DC motor is encased in a waterproof plastic casing and the shaft is used to drive an external arm that pumps water. The Pump requires a 5V supply, which can be easily provided by batteries or AC supply.

5) Jumper wires: Connecting wires are used to connect various components in an electronic circuit. They allow for the transfer of electricity, data, or signals between different devices and components. When connecting wires to an Arduino or other microcontroller, it is important to pay attention to the correct pinout. The pinout refers to the arrangement of pins on the microcontroller and the corresponding function of each pin.

6) USB –A to B cable: The staple of any USB connection, the DataPro USB A to B cable connects any standard host device (computer, hub, or controller) to any standard peripheral (printer, scanner, external drive).

7)9v Battery: The nine-volt battery is an electric battery that supplies a nominal voltage of 9 volts.

SOFTWARE COMPONENT :

Arduino IDE:

1. Arduino IDE is an open-source software, designed by Arduino.cc and mainly used for writing, compiling & uploading code to almost all Arduino Modules.

2. It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.

3. It is available for all operating systems i.e.MAC, Windows, Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role in debugging, editing and compiling the code.

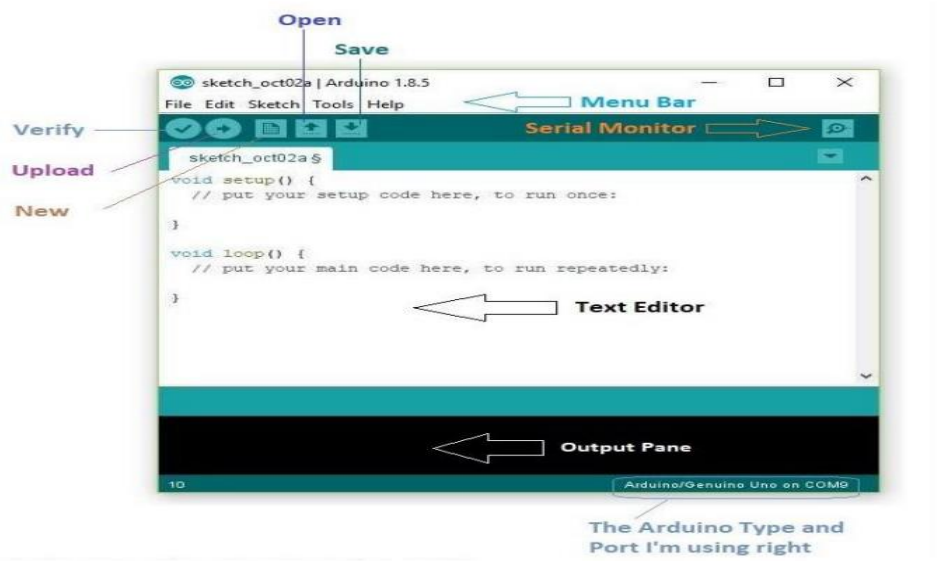
4. A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more.

5. Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code.

6. The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board.

7. The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module.

8. This environment supports both C and C++ languages.



WORKING PRINCIPLES :

The working priciple of the system is :

➢Initially the Arduino gets power from the supply .

➢As the sensor used is analog sensor the analog input is given to Arduino Uno , and output is observed in the dc motor.

➢Here we have used DC Motor to obtain the output, so the output will be obtained at the digital pin D3.

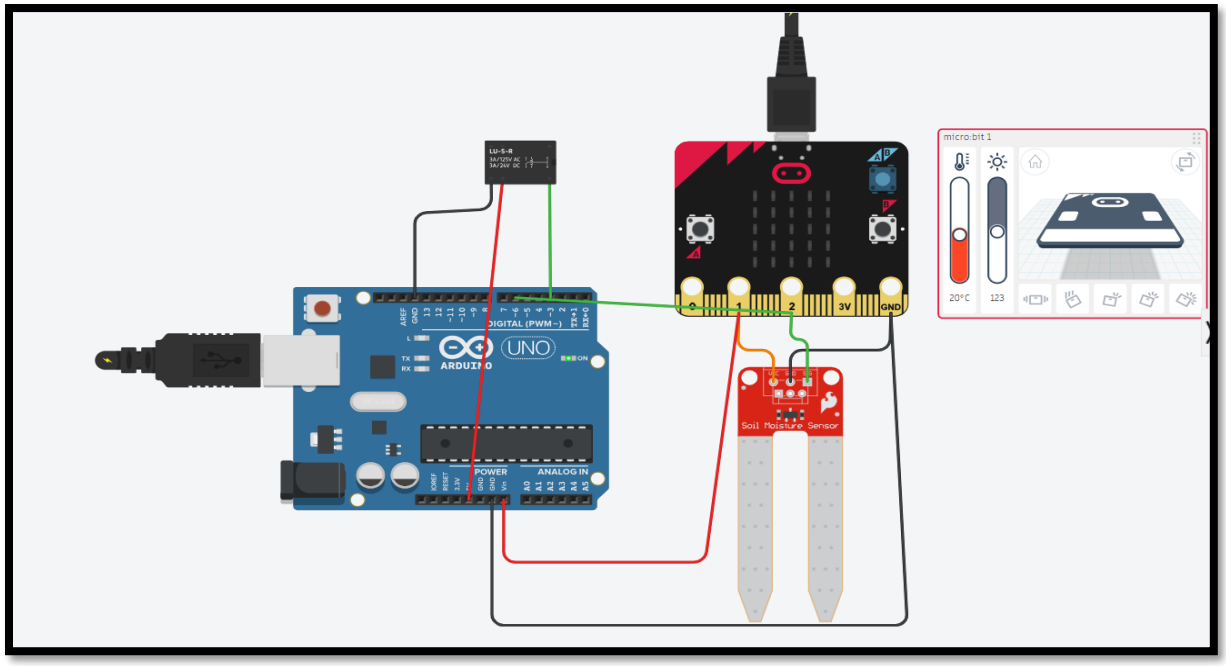
➢ The soil moisture sensor probes which are in plant senses the threshold voltage ,if the threshold voltage is less than 2.5mV then the motor runs until the sufficient water is provided to the plant .

➢And if it is greater than 2.5mV then motor stops.

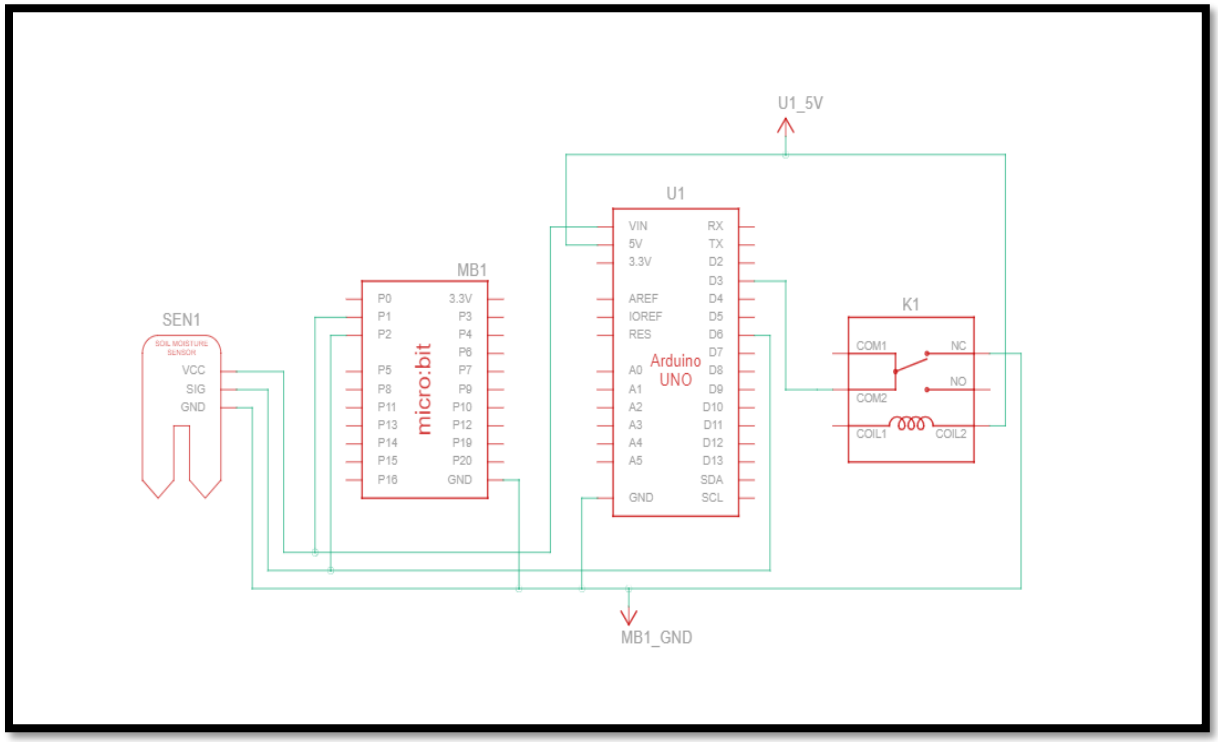
CONNECTIONS:

- Connect Soil Moisture sensor D0 to the 6th pin of the Arduino and Vcc to the Vin of the Arduino.
- Connect Relay module IN to the 3rd pin and Vcc to the 5v of the Arduino respectively.
- Connect Respective Components ground terminals to the ground pin of the Arduino.
- Connect DC motor positive to NC and Battery positive to COM of the Relay module and connect DC motor negative and Battery negative .
- Place the soil moisture sensor in the plant soil.

CIRCUIT DIAGRAM :



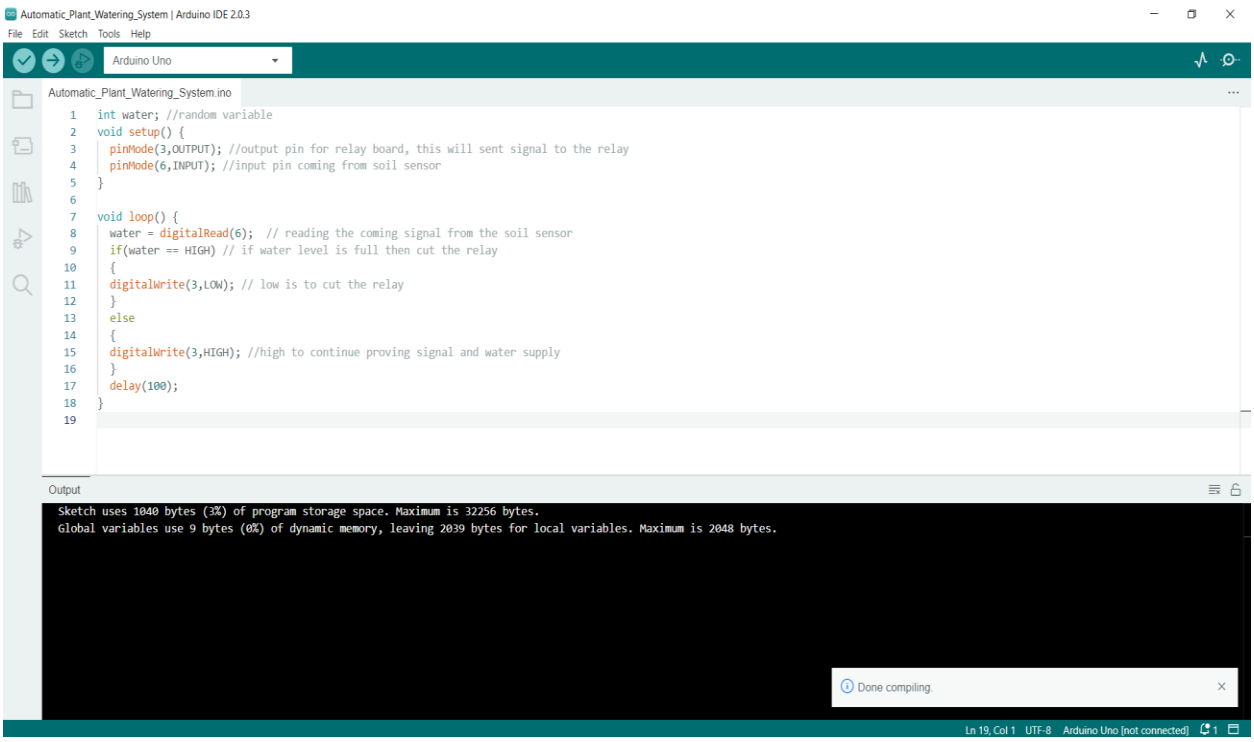
SCHEMATIC DIAGRAM:



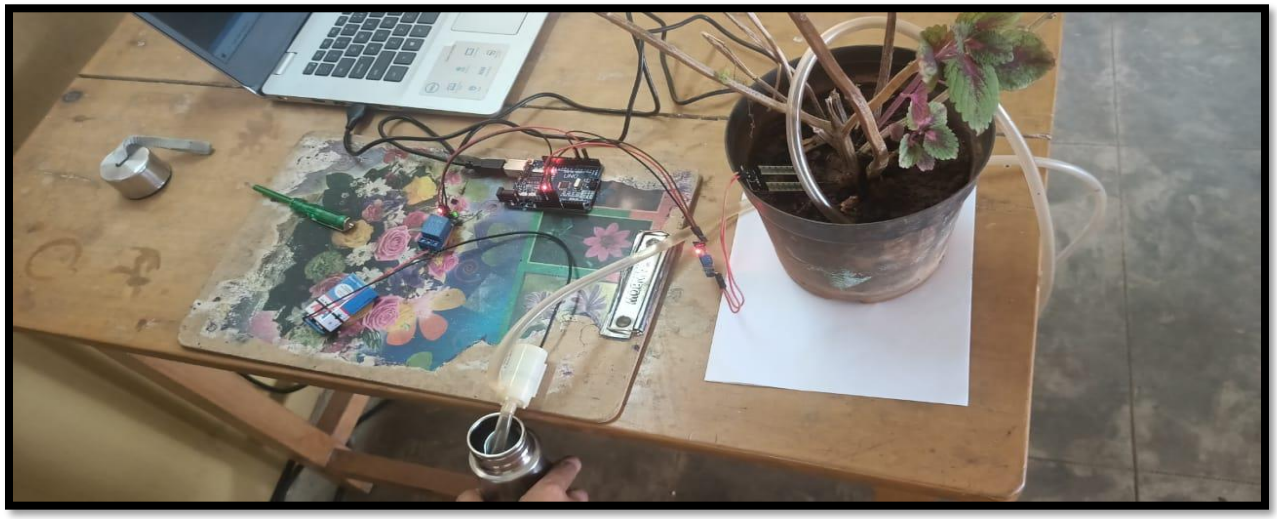
CODE:

```
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
  }
  delay(100);
}
```

OUTPUT IMAGES:

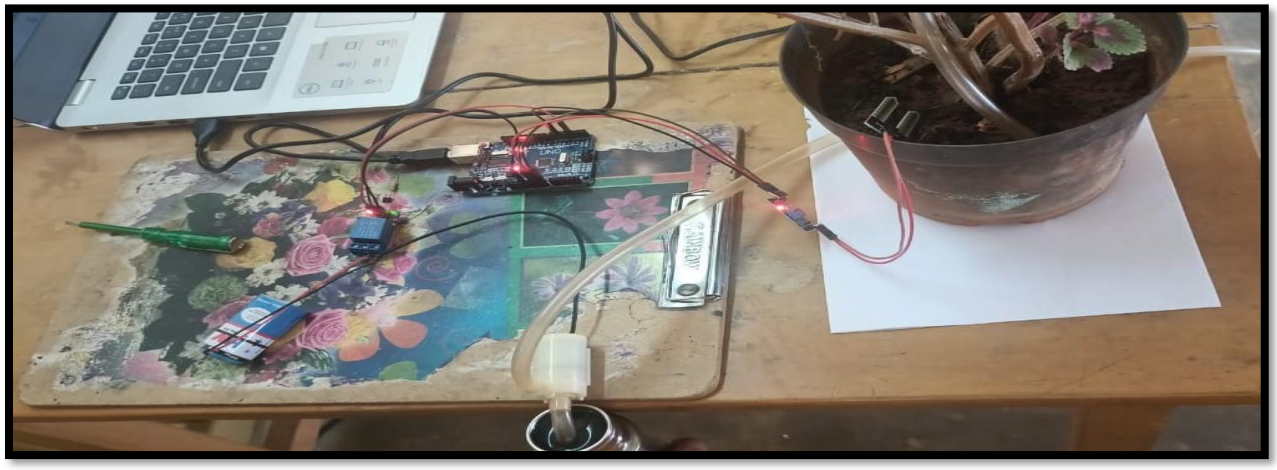


Design of the system:



Output when threshold voltage is below 2.5mV

Output when threshold voltage is above 2.5mV



ADVANTAGES :

➢ The main advantage of this project is that it has faster execution when compared to manual execution of the process.

➢ It is simple, portable and provides high performance.

➢ It consumes less power

➢ Dryness can be easily detected in soil.

➢ Permits a non- expert to do the work of an expert.

➢ Improves productivity by increasing work output and improving efficiency.

➢ Saves time in accomplishing specific objective.

➢ This system ensures that the plants do not endure from the strain or stress less and over watering.

➢ This system saves labour cost and water up to 70%. The working of this irrigation system covers over 40 crops spanning across 500 acres.

APPLICATIONS:

- This system can be used in roof gardens in highly populated areas where land is expensive and gardening on rooftops seems like the only viable option left.
- The lawns of houses and public buildings can be maintained by these systems, thereby reducing the need for human monitoring.
- The greatest application is in agricultural lands, where farmers are assisted greatly by this. There is no need for the farmer to actually be present during operation.
- Gardens that need to be monitored in the absence of home owners require systems like APIS. Home gardens that are maintained with large effort by home owners require proper observation and maintenance. It can be provided by APIS.
- This system can be used in the field of pisciculture. Fish farming or pisciculture involves raising fish commercially in tanks or enclosures, usually for food. It is the principal form of aquaculture, while other methods may fall under mariculture. The fishes need to be in a depth of 1m in the aquarium and this depth is maintained with the help of APIS. The appropriate threshold value is assigned and the circuit is operated.
- Irrigation in parks needs to be done even when people are not there to maintain thegrass or trees.
- Detection in this manner is cheap, non-invasive and can be applied on a population-wide scale.
- The presence of technology in all aspects of life has enabled solutions to real life problem that were either difficult or unfeasible.

CONCLUSION:

Irrigation becomes easy, accurate and practical with the idea above shared and can be implemented in agricultural fields in future to promote agriculture to next level. The output from moisture sensor and level system plays major role in producing the output. Thus the “AUTOMATIC PLANT IRRIGATION SYSTEM” (APIS) has been designed and tested successfully. It has been developed by integrating all the features of all the hardware components used. Presence of every module has been reasoned above and placed carefully in order to contribute to the best working of the unit.

The system has been tested to function automatically, and to the best of its ability. The moisture sensors measure the moisture level (water content) of the different plants. If the moisture level is found to be below the desired level, the moisture sensor sends the signal to the operational amplifier which triggers the DC Motor pump to turn ON and supply the water to respective field area. When the desired moisture level is reached, the system halts on its own and the DC Motor pump is turned OFF. Thus, the functionality of the entire system has been tested thoroughly and it is said to function successfully.