# CYBERNETIES BASED AUTOMATIC IRRIGATION SYSTEM USING IOT

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*Abstract :* The main objective of this work is to control the water level for irrigation remotely through internet and also to optimize the usage of water resources in the process. The method employed continuously monitors the soil moisture level to decide whether irrigation is needed, and how much water is required in the soil. A pumping mechanism is used to deliver the required amount of water to the soil. A moisture sensor is constructed to model the electrical resistance of the soil; a regulated 12 volts power supply unit is constructed to power the system; the control circuit is implemented using Node MCU board; and the pumping subsystem, consisting of a submersible low-noise micro water pump is constructed using a small dc-operated motor. Then it can be operated through Google assistant, mobile phone, website link, #tag post in FB

***Keywords— soil moisture, control, pumping, , Google assistant, tag post in FB.***

## I. INTRODUCTION

Agriculture is the major backbone of Indian Economy. Most of the available fresh water resources are used in Agriculture. In India most of the irrigation systems are operated manually which is not automated. In the recent years automated and semi- automated technologies been deployed for irrigating the field which has replaced the traditional Agricultural mechanism. The available traditional methods of irrigation are drip irrigation, ditch irrigation, sprinkler system. This problem can be easily rectified by making use of the automated system rather than the traditional systems. The current irrigation methodology adopted employ uniform water distribution which is not optimal. So accordingly technologies are being applied towards agricultural monitoring which is required by farmers.

Irrigation is the application of controlled amounts of water to plants at needed intervals. Micro Irrigation, It is an artificial supplying of water to the root of plant. Irrigation has been used to assist in the growing of agricultural crops, maintenance of landscapes, and re-vegetation of disturbed soils in dry areas and during periods of inadequate rainfall. In crop production, irrigation helps in protecting plants against frost, suppressing weed growth in grain fields and preventing soil consolidation. Irrigation systems are also used for dust suppression, disposal of sewage, and in mining. The old method used for irrigation was the use of watering cans, water channels that have to be opened and closed manually or backpack sprinklers. In this case, a lot of water is wasted. There is need for improvement on the existing or old forms of irrigation. An automated irrigation system needs to be developed to optimize water use for agricultural crops. An intelligent automatic irrigation system has to have all the components that automatically monitor and control the level of water available to the plants without any failure or manual intervention.

## II. LITERATURE

One of the approaches for automatic irrigation control uses GSM [1] in which the irrigation will take place only when there will be intense requirement of water that save a large quantity of water. This system uses an Android App. This App makes use of the GPRS feature of mobile phone and sends an SMS through GSM module of mobile to specify under irrigation, over irrigation. This system covers lower range of agriculture land and not economically affordable.

Another approach [2] uses GSM and Android mobile to control and automate the water level in the soil. The system continuously monitors the water level (Water level Sensor) in the tank and provide accurate amount of water required to the plant or tree (crop). The system checks the temperature, and humidity of soil to retain the nutrient composition of the soil managed for proper growth of plant. Low cost and effective with less power consumption using sensors for remote monitoring and controlling devices which are controlled via SMS using a GSM using android mobile.

## III. PROPOSED WORK

In this model, Artificial intelligence based Automatic Irrigation System using IOT technology is proposed uses a Node microcontroller which is a low power device is used for controlling the motor pump. The system has a distributed wireless network of soil-moisture sensor is placed in the root zone of the plants and sense the condition and transfer the information to centralize node and other nodes. When nodes are receiving the information then system will be start automatically. The proposed method allows the farmers to control the water pump through two ways.

1. Automatic control of water pump
    - Through sensing moisture level to turn ON/OFF pump.
    - Through set a certain time to turn ON/OFF pump.
2. Manual way of controlling water pump using Android device
    - Through GOOGLE ASSISTANT.
    - Through BLYNK application.
    - Through website link.
    - Through FACEBOOK #tag post.

The advantages of automatic irrigation to the plants include saving money, water, conservation of labor and overall convenience. The water supply needed by the system to perform its irrigation function can be from any source, i.e. well, river, stream, pond, lagoon, etc. However, it is most desirable if a constant source of water is available to the system in order to ensure continuity of operation. The most preferred arrangement will be a water reservoir which is constantly maintained at full capacity or a large source of fresh water which remains continually available irrespective of variations in weather or climatic conditions.

Artificial Intelligent is to be used in case of Agriculture practices. The intelligent system performs the following functions:

1. Continuously monitor the amount of soil water available to plants (this is usually achieved using a sensing system).
2. Determine if watering is required for the plants based on the information obtained from monitoring the soil water content.
3. Supply exact (or approximate) amount of water required for the plants. This will be enhanced by how well it achieves requirement.
4. Discontinue the water supply when the required amount has been delivered to the plants. This feature is important as the amount of water available for the irrigation system is not infinite, therefore water management is paramount.

### *A. SYSTEM DESCRIPTION*

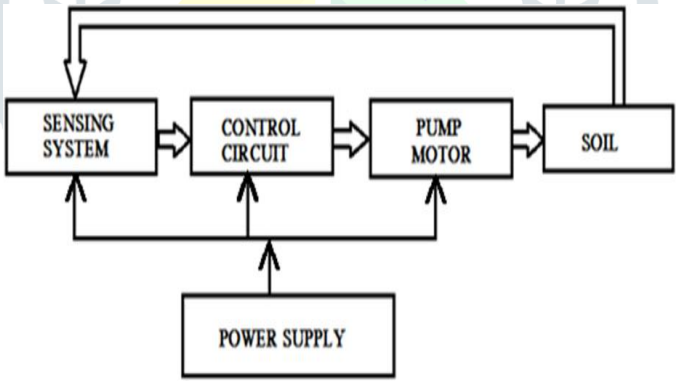


Fig 1. Block Diagram of Proposed Method

The moisture sensors are designed using probes made from corrosion-resistant material which can be stuck into soil sample. Voltage levels corresponding to the wet and dry states of the soil sample were computed by measuring the resistance between the moisture detector probes and matching them to output voltages of a comparator circuit. A submersible low-noise micro water pump was developed to deliver the water to the appropriate parts of the soil (the base of the plants). The volume of water required for irrigation per time was computed by considering the capacity of the water pump and the water channels.

**SOIL MOISTURE SENSOR YL-69:**

The soil moisture sensor or the hygrometer is usually used to detect the humidity of the soil. So, it is perfect to build an automatic watering system or to monitor the soil moisture of your plants. The sensor is set up by two pieces: the electronic board (at the right), and the probe with two pads, that detects the water content (at the left).

Fig 2: Moisture Sensor

Soil moisture sensors typically refer to sensors that estimate volumetric water content. Another class of sensors measure another property of moisture in soils called water potential; these sensors are usually referred to as soil water potential sensors and include tensiometers and gypsum blocks.

The sensor has a built-in potentiometer for sensitivity adjustment of the digital output (D0), a power LED and a digital output LED, as shown in the following figure.

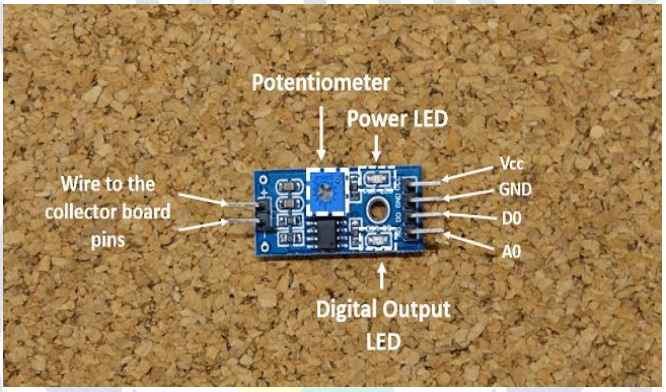


Fig 3**:** Soil Moisture Sensor Module.

***B. PRINCIPLE OF OPERATION***

There are about six different types of operational methods, proposed for scheduling irrigation effectively:

- Automatic ON/OFF pump through sensing the moisture level in soil.
- Operating pump through mobile phone application.
- Operating pump through GOOGLE ASSISTANT.
- Operating pump through SOCIAL MEDIA (by posting #hash tag message).
- Operating pump through website link.
- Operating pump by setting particular time.

The method of monitoring the soil moisture based on moisture sensing is employed in this project work. By this method, the amount of water supplied to the agricultural products is minimized, thereby reducing the cost of crop production. It is a better way to monitor the environmental conditions and avoid wastage of water is by the using sensor network.

The automatic irrigation system is designed to continuously sense the moisture level of the soil. The system responds appropriately by watering the soil with the exact required amount of water and then shuts down the water supply when the required level of soil moisture is achieved. This project uses the IFTTT software and BLYNK application, to control this pump with the above mentioned methods (Google assistant, etc). IFTTT stands for IF THIS, THEN THAT. It means if any condition occurs then respective task is accomplished.

A 12 V dc-powered motor is used in designing the pump. The motor is powered from the 12 V dc output of the power supply circuit. The pump is able to supply 250 $cm^3$ of water in 10 seconds.

**1. <u>Automatic ON/OFF pump through sensing the moisture level in soil:</u>**

In this type of operation, the soil moisture sensor will monitor the moisture level in the soil and send feedback to the Node MCU board. When the moisture level is Low then the motor starts pumping water and

when it gets sufficient moisture level the motor stops pumping. Thus, there is no need for manual interventions in the system. The system also reduces wastage of water, and reduces the power consumption.

Remaining five methods comes under ARTIFICIAL INTELLIGENCE. The node MCU micro-controller has been used for operating the motor from any part of the world by using internet connectivity. This operation of connecting various devices through internet is known as IOT Technology which is tremendously used in this present world.

2. **Operating pump through mobile phone app:**

In this type of operation, we can control motor ON/OFF through mobile phone app known as BLYNK app. This operation can be done from any part of the world and not dependent and mobile phone geographic positions. Thus, this is smart way of controlling motor from anywhere through mobile phone app.

3. **Operating pump through GOOGLE ASSISTANT:**

In this type of operation, we can control motor ON/OFF through GOOGLE ASSISTANT in the mobile phone, this operation can be done from any parts of the world not dependent upon motor and mobile phone connection. It will make ease of handling motor operations even for differently enabled persons. Thus, this is smart way of controlling motor through GOOGLE ASSISTANT.

4. **Operating pump through social networking:**

In this type of operation, we can control motor ON/OFF through social networking sites like facebook, this operation can be done in any parts of the world not depend upon where motor and mobile phone connection are existent. Thus, this is smart way of controlling motor through Facebook.

5. **Operating pump through website link**:

In this type of operation, we can control motor ON/OFF through website links, this operation can be done in any parts of the world not depend upon motor and mobile phone geographical positions.

6. **Operating pump by setting particular time:**

In this type of operation, we can control motor ON/OFF through website links, this operation can be done in any parts of the world by setting particular time. For example: setting time to turn ON, at 5:00AM and 6:00pm every day.

## IV. RESULTS

Fig 4: Final Project model

The amount of water required for a plant is not equal for all the plants. So the moisture value will be different for plant to plant. For example: the moisture level required for NEEM plant is **800m^3** thus, the threshold value of 800m^3 is taken. The moisture value of the neem plant at different times is as shown below:

Table 1: Controlling the Pump for Different Moisture Values

| S.NO | MOISTURE VALUE | PUMP (ON/OFF) |
|---|---|---|
| 1 | 223 | ON |
| 2 | 508 | ON |
| 3 | 840 | OFF |
| 4 | 780 | ON |
| 5 | 810 | ON |
| 6 | 830 | OFF |

From the above table, It can be deduced that, if the moisture value is higher than threshold value (800), then the pump remains OFF and Vice-versa

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