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Automatic Plant Watering System

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Abstract: In India, most people depend on agricultural farming. A system is needed for resolving the many issues regarding the development of agricultural farming. Hence, an IoT based Automatic Plant Watering System. This system can be implemented on projects like green building concepts, roof farming, etc. The device will be connected to the internet so that the user can get updates about change in the moisture level. The two major parts of the water supply method is to know when and how much water to supply to the plants. This system is implemented such that it will sense the soil moisture content of the plant, and if it is less than the threshold, then it will turn the motor ON. If the soil moisture content of the plant has crossed the threshold, then it will turn the motor OFF. The Automatic Plant Watering System uses the latest IoT technology which is helpful and leads to easy farming for the farmers.
Keywords: Smart Irrigation, IOT Smart system, Planting using IOT, Smart watering

I. INTRODUCTION

Irrigation is the process of giving water to plants for their growth and development. Traditional agricultural systems require huge amounts of money for on-site irrigation power.
In this, we will study the smart technique of irrigation, Automatic Plant Watering System. It is used to detect the moisture from the pots, in what amount it is present, its percentage etc. We will get this whole data and by Arduino we can get all the information regarding the water supply. Using this data, we can determine the amount of water to be supplied to a variety of crops based on Plant's seasonal requirements.
It detects the moisture using a sensor present in the machine. The data then provided gives an idea about the amount of water required to undergo the moisturizing process.
Monitoring Moisture values helps in better understanding of the environment. This method validates the input parameters like soil moisture, temperature, and humidity to predict any environment changes. As a result, we can obtain the amount of water to be used for that particular crop seasonal wise.

II. METHDOLOGY

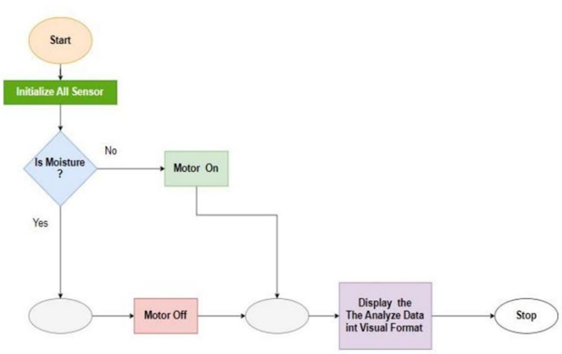

Fig. Methodology

A Wi-Fi module (Node MCUESP8266) is connected with a soil moisture sensor by jumper wire. Ground and Vcc of NodeMCU are connected with ground and 3V of moisture sensor, respectively. We will keep the long wire for the pump for convenience. Now we connect the pump with the battery.

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The relay module works on the principle of magnetic force attraction once the circuit of the relay senses the fault current. Its energies the electromagnetic field that produces the temporary field. This field moves the relay coil for gap or closing the connections, that's why we have a tendency to connect a relay in between the motor and battery and connect the opposite 2 pins with NodeMCU. According to the proposed circuit, when the moisture content in the soil is less, water is required, but when the moisture content is enough, then there is no need to pump the water.

III. PROPOSED SYSTEM

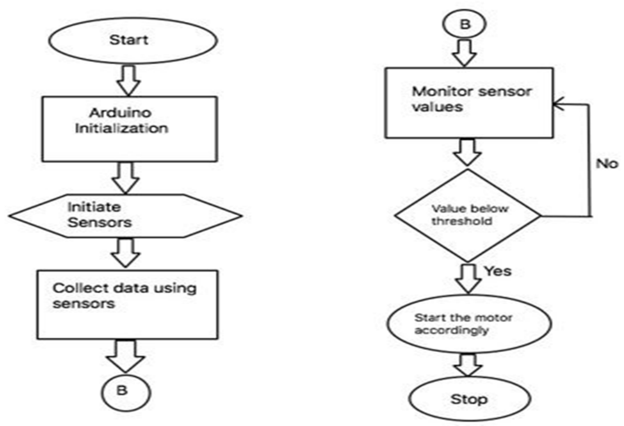

Fig. Project flow

A. *Interfacing Soil Moisture sensor with Arduino*

For this, we will need a male to female 1 pin connector, a female pin connector, and a soil Moisture Sensor. Now we take two female pin connectors and then make a connection between the soil moisture sensor module and the probe. The polarity of the connection between the probe and the module does not matter. Now we take the male to female connector and connect them to the VCC, GND, and A0 pin of the soil moisture sensor. Now connect the A0 pin of the Soil moisture sensor to the A0 pin of the Arduino. GND pin of the Soil moisture sensor to the pin of the Arduino. VCC pin of the Soil moisture sensor to the 5-volt pin of the Arduino.

From this all we connect the ESP8266 and Soil Moisture Sensor to the Arduino UNO board.

B. *Powering up Water Pump*

Red wire of the motor to MA1 pin1(+). Black wire of the motor to the MA2 pin (-). Male to male single pin connector-> CV. Connect the V-pin on the motor driver to the ground pin on the Arduino UNO. A motor driver needs external power that can be supplied to the motor. For this interface, the battery connector is needed which first connects the male pin connector to the VCC and the GND pin of the motor driver. Connect the enable A pin on the motor driver to the SV. Arduino UNO pin input pins on the motor driver should be connected to the appropriate pin on Arduino, which will provide the signal to drive the connected motor.

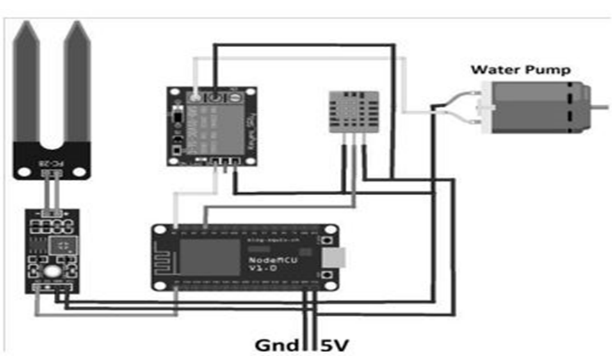

Fig. Output Model

During the period, all data will be uploaded to Thing 's cloud website, allowing farmers to monitor field statistics. A DHT11 sensor can be added to monitor humidity and temperature in the field, so farmers can know if climatic conditions are good or bad for their crops. The system works whenever there is power, and uploads data to the cloud every 25 seconds. You can monitor statistics on channel. The engine will not turn on unless the soil moisture is below the limit. The channel has charts, used to monitor statistics. There are 4 charts for monitoring. They are temperature, humidity, soil moisture level, and engine status.

On an average, using the traditional way, we used 1 lit water for irrigation when there was lack of moisture in soil. Totally we spent 2 liters of water in four days for clay. On other hand our system used approximately 1.34-1.4 lit water in duration. The retention capacity of clay was high, so it took 59-60 hours to go below 20% moisture content. For sand in four days, we used 4lit water on daily basis, system used 2.7-2.83 lit water approximately. The retention capacity was low, so it took 36-38 hours for losing moisture and again irrigating. For mix sand and clay, we used 3 liters of water in four days, the device used approximately 2-2.2 liters of water and the retention time was 45-47 hours. So, on an average we saved water 30%-33% on an area of 1.5ft*1ft, that we used for my study.

C. Connection Schematic

ESP8266	Arduino UNO
VCC	3.3 V
CH_PD	
GND	GND
RX	Pin 4
TX	Pin 3

D. Thing Speak Web Page

We have used this free website for monitoring online our system and also for exporting the data that is collected. API key is shown below here.

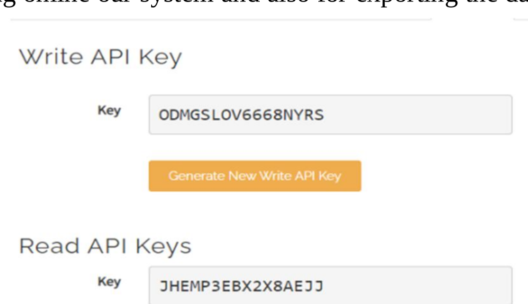

Fig. API

Here we have used visual graphs for monitoring, each data uploads every 25 seconds and graph is automatically plotted on site. Some of the graph that are used in monitoring the system are listed below:

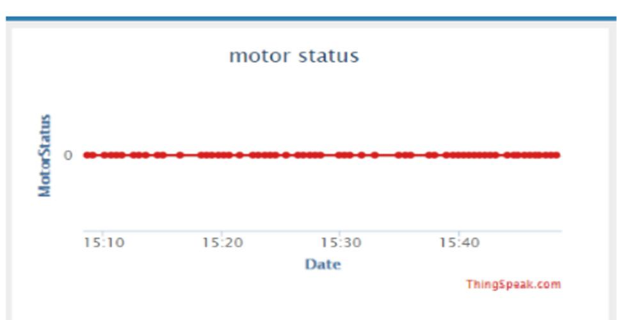

Fig. Motor Status Graph

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From all data collected in three phases as per soil types, we found that the retention or moisture holding capacity of clay is higher than mix of clay and sand, and the lowest moisture holding capacity was for sand.

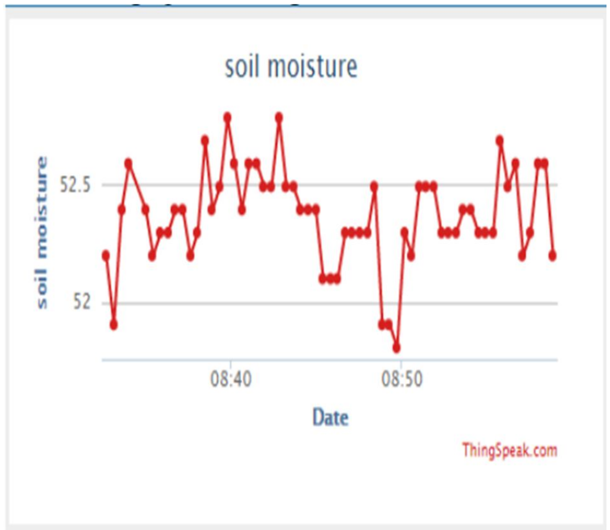


Fig. Soil Moisture Graph

IV. LITERATURE SURVEY

This paper proposed an Intelligent Smart Irrigation System. It follows the KNN Algorithm to understand and detection of moisture. It Collects data from various sources such as from machine sensor, weather forecast etc. and form the equation and combines them together to make up final result and form a decision to find equidistance. This decision helps in watering plants to detect their level of moisture [1].

In this paper, the soil moisture sensor plays an important role. Moisture sensor not only detects moisture but also air temperature, air humidity, UV, soil temperature. All these data is used to maintain the level of moisture [2].

In this paper, Smart Irrigation System is developed. Its main purpose is to save water, keep plants and soil irrigated and without much of human support. A sensor will gather various readings from soil and based on moisture present, pump will turn on. It will be used to Irrigate land automatically. The data will be shown on user's device screen [3].

This paper proposed an IoT Based Smart Irrigation Architecture. It follows a Hybrid Machine Learning Algorithm to understand and complete the needs of plants.

It collects data from various sources such as from machine sensor, weather forecast etc. and combines them together to make up final result and form a decision. This decision helps in watering plants [4].

In this paper, a small Smart Irrigation System is developed. It is based on Internet of Things. It is system controlled using a computer. It is used to detect moisture content present in the soil. Once it understands that water moisture is below certain threshold a switching system will turn on the system and will provide with water and care to plants. It is used mainly for saving time and energy [5].

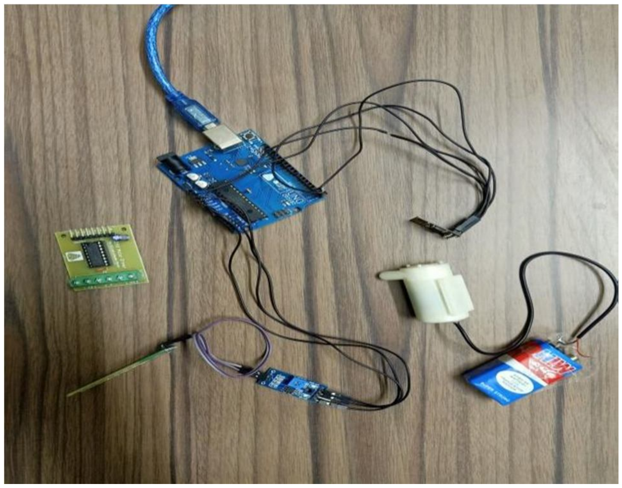
In this paper, the sensor plays an important role. Moisture sensor detects moisture but also check the time by delaying and closing the time interval to supply sufficient amount of water. Solenoid value is used to maintain level of moisture [6].

In this paper, application of IOT and Cloud computing is used. It is a mobile application. It is used to detect moisture content present in the soil and shares all the required details to the farmer online. It follows the machine learning algorithm to store the data. It stores fresh water which is used to water supply plants. It is used mainly for saving of water [7].

In this paper, Irrigation System is developed with respect to initial objective. Its main purpose is to detect what amount of water is used for irrigation purpose area wise. It will be used to Irrigate land automatically. The data will be shown in big zone [8].

This paper proposed a Sprinkler Irrigation System. It follows a Socioeconomic aspect. It Collects data from various sources such as from machine sensor and combines them together to find what number of sprinklers are used seasonal wise and crop wise and make up final result. This decision helps in watering plants to detect the level of moisture at the seasonal level [9].

V. EXPERIMENTAL RESULTS



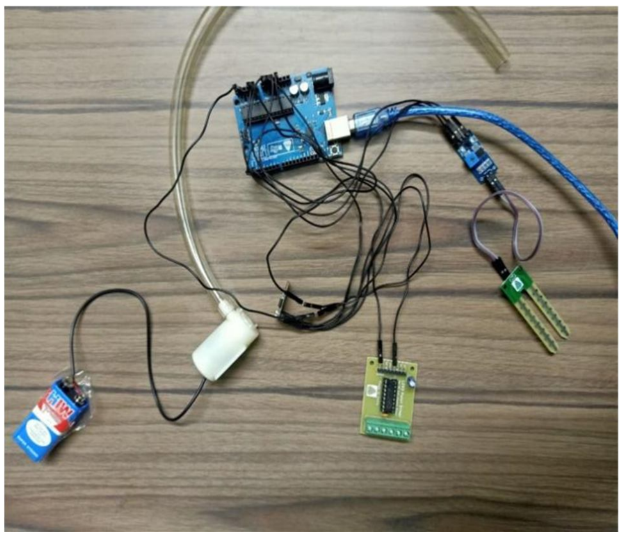


Fig. Proposed System Model

VI. CONCLUSION

Water is life and it is important to save water. Without water not only humans, but also other living organisms won't exist. In today's world where pollution, water wastage are at all-time high it becomes extremely necessary to have clean water and to save it. Thus, Smart Irrigation System helps in doing. So, it gives live readings of moisture content in soil and can then be irrigated automatically or manually.

At the current state of system, it can only be used in Irrigation of Small Plants not fully grown tree or fully fledged farm. But with proper upgrade, it can be used for farming as well. Also, this system will help to revolutionize farming sector completely if implemented correctly. Not only it will help farmers, but Overall humanity.

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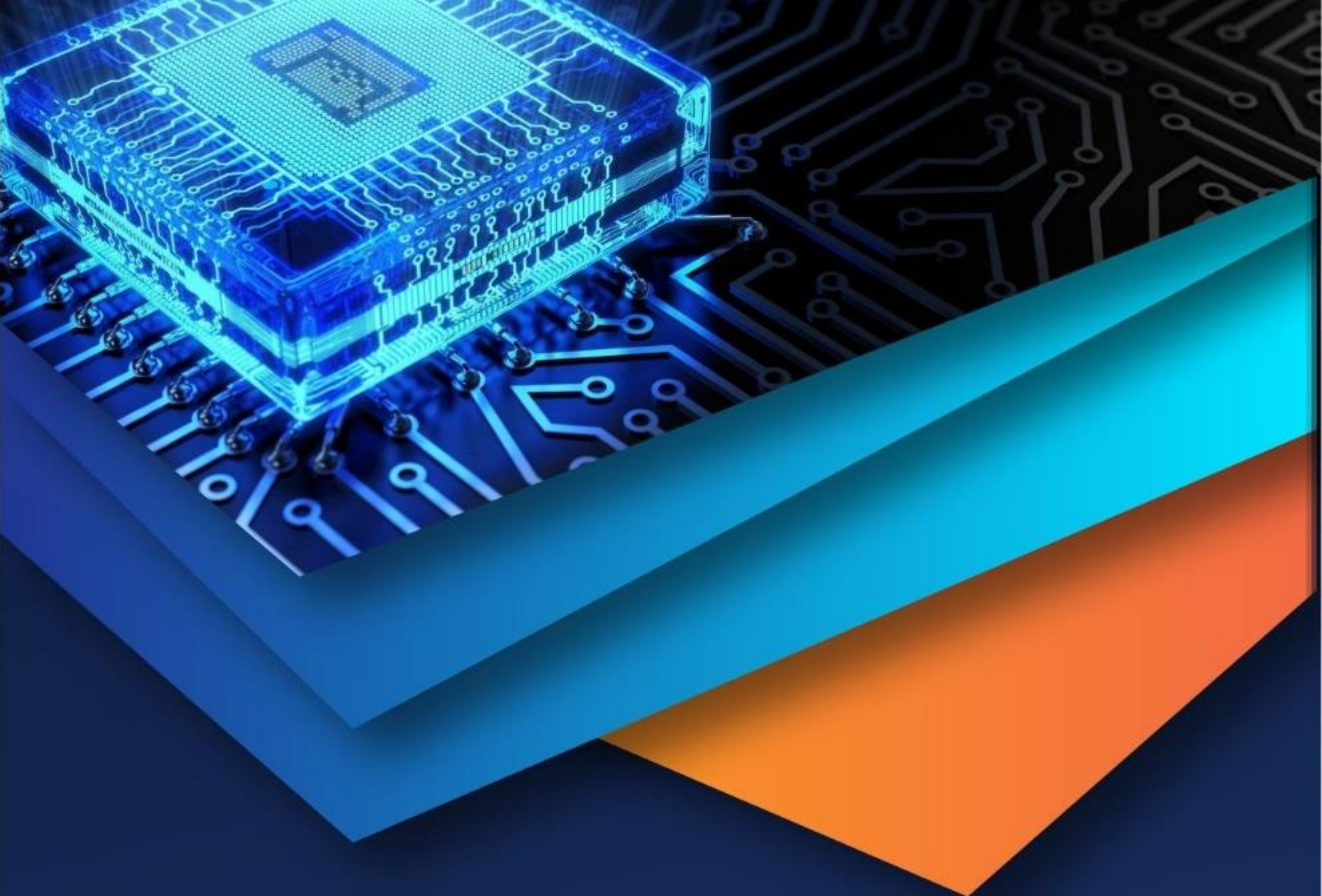

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