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IoT Based Temperature And Soil Monitoring System With Motor Pump Control.

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Abstract: This paper describes a real-time soil monitoring for the agriculture farmlands to provide optimal and integrated data collections. Real- time monitoring provides reliable, timely information of crop and soil status plays an important role in the decision making in the crop production improvement. Agriculture depends on many parameters such as inter and intra variability of plants to give better yields such as soil parameters, climatic parameters and so on. Here the system is designed to collect the data set for major parameters such as temperature, humidity, soil pH, soil moisture, light intensity and carbon-dioxide of the fields. The system consists of an ATmega 328 microcontroller, DHT11 Sensor, soil hygrometer, light intensity sensor, soil pH sensor, MQ-135 sensor and DC motor. Data sets collected were used for the analysis of selection of crops and their vulnerabilities for regulating the irrigation parameters which will be of help in the agricultural practices, it will make easy way for farmers to take decision on planting a crops, watering and fertilizing them by avoiding the interference of hydro geologists and soil scientists by giving precaution. The obtained results were compared with the standardized optimum values for the particular crops and based on the differences inputs for the crops are varied. The automated watering helps the crops to get flow of water to fields based on the parameters, which is controlled by the DC motor. Multi sensor implementation for acquiring primary parameters essential for plant growth is the main aim of the paper. Easily available sensors were a motivation for the development of this project.

Keywords:ATmega328 microcontroller, DHT11 sensor, soil hygrometer, light intensity sensor, soil PH sensor, MQ-135 sensor and moisture sensor.

I. INTRODUCTION

Fig1: Agriculture

From time immemorial agriculture has been a part ofthe human civilization. It has transformed the way humans survive. The economy of a particular area was indirectly dependent on agriculture, and was a major thrust behind the industrial revolution.

Temperature and humidity are very important environmental elements that must be controlled for healthy plants. Humidity controls the rate of transpiration and how the nutrients are received by the plants. Ideal humidity levels

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in a grow room rangebetween 50% to 70% in vegetative growth, and 50% to 60%for flowering plants.Soil moisture is one of the most important parameter influencing crop yields. Itplays a crucial role for efficient photosynthesis, respiration,transpiration and transportation of minerals and othernutrients through the plant. Proper irrigation schedule isvery critical to plant growth. If the moisture content of a soil is optimum for plant growth, plants can readily absorb soil water. Soil water dissolves salts and makes up the soil solution, which is important as medium for supply of nutrients to growing plants.

II. PROBLEM STATEMENT

The various parameter of soil like temperature, humidity and moisture are directly displayed to the user and depending on those parameter the crop is predicted by the system. It uses temperature, moisture and humidity sensor and for prediction of crops it uses greenhouse automation. The main aim of this paper is to minimize the human care needed for the plant by automating the green house and monitor the in-house environment status.

III. LITERATURE SURVEY

This system uses Arduino technology to manage watering and roofing of the green house.

1. It uses statistical data acquired from sensors (like temperature, humidity, moisture and light-weight intensity sensors) compared with the forecast for higher noises. Kalman filter is employed to eliminate noise from the sensors.
2. **Agriculture System (Argosy's)** uses temperature, pH, humidity sensors then the hybrid inference to input the knowledge from sensors. The system monitors the sensors information on LCD and PC.
3. **Muhammad (2010),**proposed a simple approach to Automatic Irrigation control problem using Artificial Neural Network Controller. The proposed system is compared with ON/OFF controller and it's shown that ON/OFF Controller based System fails miserably because of its limitations. On the other hand, ANN based approach has resulted in possible implementation of upper and more efficient control. These controllers don't require a previous knowledge of system and have inherent ability to ANN based systems can save lot of resources (energy and water) and might provide optimized results to any or all or any type of agriculture areas.
4. **Sanju Kumar (2013)**, proposed Advance Technique for Soil Moisture Content Based Automatic Motor Pumping for Agriculture Land Purpose was developed and successfully implemented along with flow sensor. Salient features of the system are: control system automatic irrigation system, temperature and water usage monitoring. User can easily preset the quantity of the Moisture and is typically updated about current value of all Parameters on LCD display. In future, other important soil parameters namely soil pH, soil electrical conductivity are visiting be incorporated within the system.
5. **S Nalini Durga (2018**) proposed Smart Irrigation System supported Soil Moisture Using Iot Agriculture remains the world which contributes the simplest to India's GDP. But when considering technology that's deployed during this field, we discover that the event isn't tremendous. Now a days there's huge enhancement in technologies which have an unlimited impact on various fields like agriculture, healthcare etc. Agriculture is that the first occupation in our country. India's major income source is wishing on agriculture therefore the event of agriculture is significant. In today also most of the irrigation systems are operated manually. The available traditional techniques are like drip irrigation, sprinkler irrigation etc. These techniques are should be combined with IoT so we are able to make use of water vary efficiently. IoT helps to access information and make major decision-making process by getting different values from sensors like soil moisture, water level sensors, water quality etc.
6. **E. Krushel, A. Panfilov, O. Stepanchenko**, "Distributed Proportional-Integral Control Law Capabilities for the Temperature Maintaining System within the Vertical Greenhouse", 2021 International Conference on Industrial Engineering, Applications and Manufacturing (ICIEAM), pp.591-595, 2021

IV. EXISTING SYSTEM

The system is developed for irrigation is on two ways:
I) System Software
II) System hardware
Software is web page designed by using PHP and hardware consists of embedded system which

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monitors soil content. In this system open source Arduino boards along with moisture sensors, it is applicable to create devices that can monitor the soil moisture content and accordingly irrigating the fields as when needed. This system introduced motor pump, Node MCU, actuators and sensors.

V. PROPOSED SYSTEM:

The system is combination of hardware and software components

I) Hardware components: Hardware and Software

Hardware

The NodeMCU: (Node MicroController Unit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. DHT11 Sensor: DHT11 is a low-cost digital sensor for sensing temperature and humidity. USB to Serial Converter – CP2102 or CH340G.

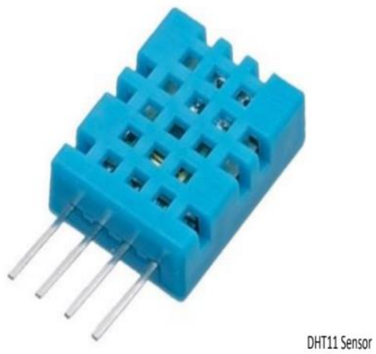

Fig2: USB to Serial Converter Fig3:DHT11 Sensor

Fig 4: Node MCU Fig 5:LCD

Software

ThingSpeak: ThingSpeak is an open-source software written in Ruby which allows users to communicate with internet enabled devices**.**

Arduino: Arduino is an open-source electronics platform based on easy-to-use
hardware and software. Arduino boards are able to read inputs - light on a sensor,finger on a button.

The Soil Moisture Sensor Module determines the amount of soil moisture by measuring the resistance between two metallic probes that is inserted into the soil to be monitored.

Soil moisture sensor is used to detect the moisture of the soil. This sensor is made up of two pieces: the electronic board at the right, and the probe with two pads, that detects the moisture content of soil.

How does it work? The voltage of the sensor outputs changes accordingly to the moisture level in the soil.

When the soil is: Wet: The output voltage decrease Dry: The output voltage increase .

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DHT 11 (Temperature and Humidity)

DHT11 consist of both humidity and temperature sensor. For measuring humidity there are two electrodes withmoisture holding substrate between them. So when the humidity changes, the resistance between theseelectrodes changes and conductivity of the substrate changes. This change in resistance are measured andprocessed by the IC which makes it ready to be read by a microcontroller.

On the other side for measuring temperature DHT11 sensor use a NTC temperature sensor or a thermistor. A thermistor changes its resistance with change of the temperature because it is variable resistor. These sensors are made by sintering of semi-conductive materials (ceramic and polymers), which provide large changes in the resistance with just small changes in temperature. The term "NTC" means "Negative Temperature Coefficient", which means that the resistance decreases with increase of the temperature

The ESP8266 Wi-Fi Module is used to give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of hosting an application or it also offloads all Wi-Fi network functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set so you can simply hook this up to your Arduino device and get about Wi-Fi-ability. The ESP8266 Wi-Fi module is used totransfer the data from Arduino to dummy sever and from server to Arduino. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and Analog I/O pins that may be interfaced to various shields and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus(USB) on some models, which are also used for loading programs from personal computer.

IoT Section

Table 1: AT Commands

AT	This will check that module is connected properly and is it functioning, the module gives acknowledgment.
AT+RST	This will reset the Wi-Fi module
AT+CWLAP	This will detect the Access points and their signal strengths available nearby.
AT+CWJAP	"SSID","PASSWORD" This connects the ESP8266 to the specified SSID
AT+CWMODE=1	This sets the Wi-Fi mode. It should be always set to Mode 1.

Fig 6: Greenhouse Automation

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VI. METHODOLOGY

1) When power supply is ON, the input module of three sensors (DHT22, moisture) start to activate

2)When sensors get ON it will read the data from soil and from surrounding.

3)According to the values that are detected by sensors motor will turn ON/OFF.

4) If Moisture below threshold value, then the motor is turn ON.

5) If moisture level is high, then it will stop the motor and water supply will also stop.

4) If Water level is low in tank, then it will also have detected by the ultrasonic sensor.

6) All the values that are collected from sensor is send via ESP8266 Wi-Fi module to Thing speak cloud server and it store in online database(firebase) via dummy server.

7) Thing speak will create the graph for the data received by WI-FI module.

8) And, then whole information will show on the Android app.

9) User can easily control the motor manually by using Android app.

VII. OBJECTIVES

1. To develop an IOT based automatic irrigation system having a low-cost equipment.
2. To monitor moisture contents at different conditions
3. To improve the system by using Mobile Phone App
4. To improve the system by using WSN (Wireless Sensor Network)
5. Improve irrigation.
6. Optimize water use.
7. Real time monitoring soil moisture and temperature.

VIII. CONCLUSION

The soil moisture is a critical parameter for developing a smart irrigation system. The soil moisture is affected by a number of environ- mental variables, e.g., air temperature, air humidity, UV, soil temperature, etc. With advancement in technologies, the weather forecasting accuracy has improved significantly and the weather fore- casted data can be used for prediction of changes in the soil moisture. This paper proposes an IoT based smart irrigation architecture along with a hybrid machine learning based approach to predict the soil moisture.

The proposed algorithm uses sensors data of recent past and the weather forecasted data for prediction of soil moisture of upcoming days. The predicted value of the soil moisture is better in terms of their accuracy and error rate. Further, the prediction approach is integrated into a standalone system prototype.. system to monitor temperature, humidity, moisture levels in the soil was designed and the project provides an opportunity to study the existing systems, along with their features and drawbacks. Agriculture is one of the most water-consuming activities. The proposed system can be used to switch the motor (on/off) depending on favorable condition of plants i.e sensor values, thereby automating the process of irrigation. which is one of the most time efficient activities in farming, which helps to prevent over irrigation or under irrigation of soil thereby avoiding crop damage. The farm owner can monitor the process online through a android App. Though this project can be concluded that there can be considerable development in farming with the use of IOT and authentication.

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FLOWCHART

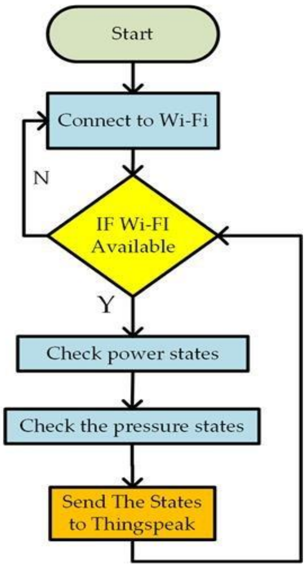

Fig 6: ThingSpeak login

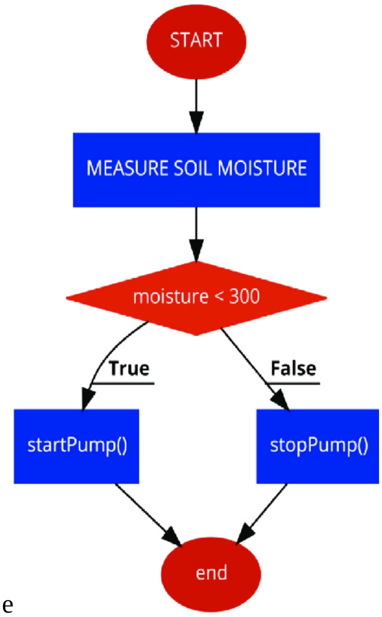

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Fig7: MotorPump

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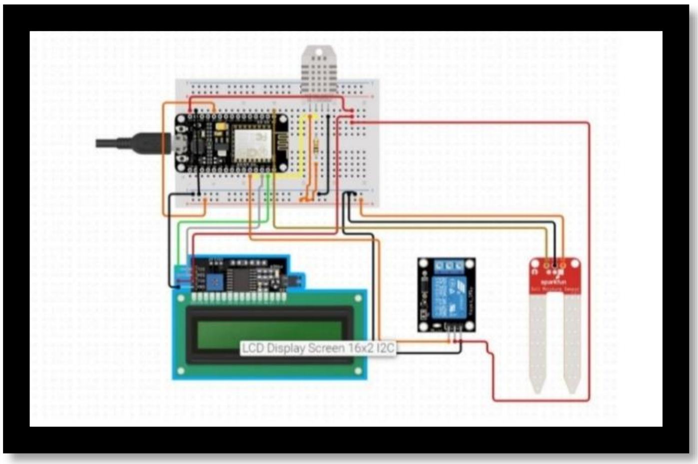

Fig 8: Circuit Diagram

RESULT

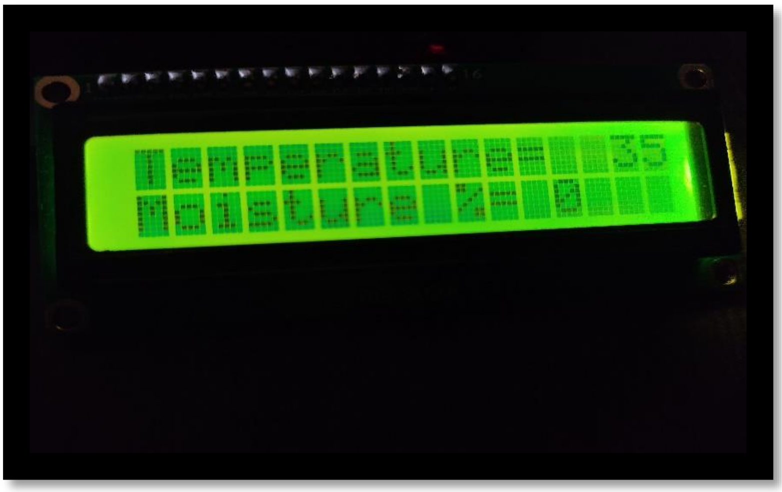

Fig 9: Output

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