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IOT Based Smart Plant Monitoring System

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A B S T R A C T

Agriculture is the backbone of our country; most of the people depend on agriculture. The main issue in agriculture is water scarcity. The water resource is not used in an effective manner, so the water is wasted. In order to overcome this irrigation process can be automated. The use of Internet of things in this field will be helpful to reduce the wastage of water. So that the temperature as well as humidity and light are measured by means of sensors and depend up on the outcome further processing can be performed. We propose a system that will capture all the details about the soil and the temperature by means of different sensors.

Keywords: Arduino Uno Board, NodeMCU ESP8266,Soil Moisture Sensor, Temperature and Humidity Sensor, Relay 5v.

1. INTRODUCTION

Plant plays a vital role in maintaining the ecological cycle and forms the foundation of a food chain pyramid and thus to maintain the plant's proper growth and health adequate monitoring is required. Hence the aim at making plant monitoring system smart is using automation and Internet of Things (IOT) technology. This topic highlights various features such as smart decision making based on soil moisture real time data.

Nomenclature

Arduino Board
NodeMCU ESP8266
Temperature and Humidity Sensor
Soil Moisture Sensor
Relay 5v

2. Literature Survey

In India about 35% of land was under reliably irrigated. And the 2/3rd part of land is depending on \monsoon for the water. Irrigation reduces dependency on monsoon, improves food security and improves productivity of agriculture and it offers more opportunities for jobs in rural areas. Farmers are facing problems related to watering system that how much water has to supply and at what time? Sometimes overwatering causes the damage to crops and as well as waste of water. Hence for avoid such damage we need to maintain approximate water level in soil.
In this paper, humidity sensor, moisture sensor, temperature sensors placed in root zone of plant and gateway unit (ESP8266) handles the sensor information and transmit data to a android application. This application is developed for measure approximate values of temperature sensor, humidity sensor and moisture sensor that was programmed into a microcontroller to control water quantity.

3.Material & Method

3.1Arduino UNO

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog

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inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

3.2 NodeMCU ESP8266

Wi-Fi Module: ESP-12E module similar to ESP-12 module but with 6 extra GPIOs,
Support UART / GPIO data communication interface / Transfer rate: 110-460800bps.
USB: Micro USB port for power, programming and debugging.
Headers: 2x 2.54mm 15-pin header with access to GPIOs, SPI, UART, ADC and power pins.
Miscellaneous: Reset and flash buttons.
NodeMCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module**.**

3.3Temperature and Humidity Sensor

Relative humidity and temperature measurement
All calibration, digital output
Excellent long-term stability
Long distance signal transmission
Low power consumption

3.4 Soil Moisture Sensor

Soil Moisture Meter Testing Humidity Sensor
Soil Humidity Sensor
Soil Hygrometer Detection Module for Arduino
Connect the wires from the other (4-pin) side of the amplifier to an **Arduino board**. The VCC goes to 5V, GND to ground, A0 to an analog pin, and D0 to a digital Arduino pin.
Instead of using weather data, soil moisture sensor controllers utilize a soil moisture sensor placed belowground in the root zone of lawns to determine water need. ... Similar to ET controllers, soil moisture controllers have been shown to reduce irrigation, while maintaining turfgrass quality.

3.5 Jumper Wires

Jumper wires are used for making connections between items on your breadboard and your Arduino's header pins. Use them to wire up all your circuits**.**

3.6 Relay 5v

Coil Voltage : DC 5V;Rated Load : 7A/250V
Number of Pins : 5;Contact : SPDT
Switching capacity to 7A.

3.7 Hardware Connection

- Node MCU sensor connect pin A0,3V And Ground Pin connected to the Soil Moisture Sensor ofA0,VCC,Ground. The pin of Temperature and Humidity Sensor is Positive, Negative and Out connected to NodeMCU sensor pin 3v,D4,Ground
- Take Soil Moisture sensor and DHT11 Sensor connect the jumper wire with Vcc pin, ground.
- LED Light you can connect an led light for notification purpose it will blink when Selonoidwter pump start..
- Blynk appConnected with the NodeMCU. This will add a plus point because you don't have to monitor the sensor it will Measure the reading Automatically

4. Implementation

The proposed Plant Monitoring System uses NodeMCU as microcontroller. NodeMCU comes with the inbuilt ESP8266 WiFimodule whichconnects our system to blynk app using WiFi. The program which controls the functioning of the whole system is fed into the microcontroller using Arduino IDE which is an environment which integrates code with the hardware. Soil moisture sensor continuously detects the level of moisture in the soil and displays it on the Virtual LCD widget on the Blynk app. If the water content in the soil is less than what is required by the plant, a notification is sent to the user‟s smartphone and he/she can switch ON the button widget in Blynkapp which will turn ON the water supply. Real time values from the DHT11 temperature sensor are also displayed on the virtual LCD. Excessive heat from the sun can be harmful for plants to prevent them from dying we introduced a green shade which will automatically be drawn over the plant with the help of two DC motors which rotate clockwise and anti-clockwise to help movement of the shade. Temperature more than 30 ^{0}C can cause shriveling of plant.
When temperature increases this limit the motor rotates and cause the shade to move automatically. The user is notified about each and every step through the notification feature of the Blynkapp. Hence, this system monitors and controls the plants requirements remotely.

4.1 Problem Faced

Along the course of project completion, we encountered various problems and obstacles. Not everything that we had planned went smoothly during the project development span. Also, we had a limited amount of time for its completion so we were under a certain amount of pressure as well. We had to start

from the research phase at the beginning and needed to gain knowledge on all the devices and components that we had intended to use for our project. Other phases of the project included coding, debugging, testing, documentation and implementation and it needed certain time for completion so we really had to manage the limited time available to us and work accordingly to finish the project within the schedule.

4.2Limitation

1.Automated irrigation system uses only two parameters of soil like soil moisture and temperature other parameters humidity, light, air moisture, soil ph value not taken for decision making.
2. Excessive seepage and leakage of water forms marshes and ponds all along the channels. The marshes and the ponds in course of time become the colonies of the mosquito, which gives rise to a disease like malaria.

6. Conclusion

A system to monitor temperature, humidity, moisture level 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 favourable 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 automation.

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