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AUTOMATED IOT BASED FIELD IRRIGATION SYSTEM USING NODE MCU

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Abstract :

In India, people's primary source of income is agriculture. It is important to the nation's economy. Agriculture is currently hindered by the migration of people from rural to urban areas. The only way to boost crop productivity is by keeping an eye on the environmental aspect. There aren't many things that significantly reduce productivity. Thus, automation needs to be used in agriculture to solve these issues. irrigation system that runs automatically, saving the farmer's time, money, and energy. Every aspect of the average person's life has undergone change because to Internet of Things (IoT) technology, which has made everything smart and intelligent. The Internet of Things (IoT) is a network of autonomous devices. In addition to improving agriculture production, the development of intelligent smart farming IoT-based equipment is also lowering waste and increasing cost-effectiveness. The purpose of this paper is to suggest an IoT-based smart farming system that will help farmers obtain real-time data (temperature, soil moisture) for effective environment monitoring, allowing them to improve overall production and product quality. This report proposes an IoT-based Smart Farming System that combines Nodemcu IoT Technology with several sensors, a WiFi module, and a live data feed that can be accessed online from Blynk.

Keywords : NodeMCU,DHT11,SoilMoisture Sensor, pHSensor,Relay Module, Blynk app.

INTRODUCTION :

Agriculture is major source of income for the largest population in India and is major contributor to Indian economy. In past decade it is observed that there are not much crop development in agriculture sector. Based on the survey it is observed that agriculture contributes 27% to GDP, and Provides employment to 70% of Indian population. Food prices are continuously increasing because crop rate declined. There are number of factor which is responsible for this it may be due to water waste, low soil fertility, Fertilizer abuse, climate change or diseases etc. It is very essential to make effective intervention in agriculture and the solution is IOT in integration with wireless sensor network. Internet of things (IOT) is a method of connecting everything to the internet- it is connecting object or things (such as car, home, electronic devices, etc. ...) which are previously not connected with each other main purpose of IOT is ensuring delivery of right information to right people at right time. In agriculture irrigation is the important factor as the monsoon rain falls are unpredictable and uncertain. According to statistics, agriculture uses 85% of available freshwater resources worldwide, and this percentage will continue to be dominant in water consumption because of population growth and increased food demand. There is an urgent need to create strategies based on science and technology for sustainable use of water, including technical, agronomic, managerial and institutional improvements. Agricultural irrigation based on Internet technology is based on crop water requirement rules. By using Internet technology and sensor network technology we can control water wastage and to maximize the scientific technologies in irrigation methods. Hence it can greatly improve the utilization of water and can increase water productivity.

LITERATURE SURVEY :

Water, time, and money are all saved with smart irrigation systems. According to studies, cloud-based Smart Irrigation systems can reduce the amount of water used for landscape irrigation by up to 50%. Because of the consequent water savings, Smart systems often pay for themselves within two years. In this literature review, we will discuss some of the research studies that have been conducted on smart irrigation systems using IoT .

1. Smart Irrigation System with Message System using Arduino and GSM module written by Saurav Kumar, Vishal Kumar Sinha, Manish Kumar Mukhija, Yashika Saini, Shashi Shankar, Vikash Kumar. The main motive of this project is to use Arduino and GSM to monitor and manipulate water drift to an irrigation machine.

2. An Internet of Things Based Smart Irrigation using Solenoid Valve written by K.Kannan, N.Sai kumar, E.Logith, R.Manoj Kumar, O.Surya prakash. As the use of IOT with Solenoid valves, reduce the water consumption compare to other irrigation methods.

3. Smart Irrigation System using Arduino with Solar Power written by Saleh Elkelani Babaa,Muneer Ahmed,Babatunde Samuel Ogunleye,Salim Ahmed Al-Jahdhami,Salim Ahmed Al-Jahdhami,John Regan Pillai. This paper deals with the innovative technology in considering the various ways to irrigate the agricultural land using solar power.

4. A Low-Cost Arduino-based Smart Irrigation System (LCABSIS) written by Jolan Baccay Sy, Edward B. Panganiban, Abdulkerim Seid Endris. The system is designed to allow farmers to be more efficient, to reduce labor expenses and to make reasonable use of water by utilizing the correct amount at the appropriate way.

5. Designing of Smart Irrigation System Using Arduino written by Abhay sharma,Lovepreet Singh,Harpreet Kaur Channi. This project on "system of automatic irrigation "automated irrigation mechanism which turns the pumping motor ON and OFF on detecting the moisture content of the earth.

6. IOT Based Smart Agriculture With Automatic Irrigation System written by Harsh Mahajan,Megha Manglani,Georgina Frank,Amish Mashru. This review paper advocates the effective use of Internet of Things in conventional agriculture. It is bases on developing a smart irrigation system using Arduino UNO and ESP8266 WiFi module.

PREFFERED SYSTEM:

Three sensors are connected to the controller in a Nodemcu-based autonomous irrigation system, and the perceived values from these sensors are sent to a mobile application. Agricultural characteristics including temperature, humidity, pH values, and soil moisture are monitored and controlled by the system, which can help the farmers to improve the output. Farmers start to use various monitoring and controlled system in order to raise the produce. An embedded system for autonomous irrigation control is part of the proposed effort. For the purpose of monitoring an irrigation system in real-time, this project has a wireless sensor network. This method prevents water waste while providing an agricultural land with the uniform and necessary level of water. The device automatically turns on the motor when the soil moisture level falls below the set threshold. The motor automatically turns off when the water level returns to normal. The user's Android application will display the sensed parameters and the motor's current state.

PROJECT REQUIREMENTS:

1.Software Requirement:

1.1 Arduino IDE

2.Hardware Requirements:

- 2.1 Node Mcu(Esp 8266)
- 2.2 Soil Moisture Sensor(YL-69)
- 2.3 Temperature and Humidity Sensor (DHT11)
- 2.4 Relay Module
- 2.5 pH sensor
- 2.6 DC Motor Pump
- 2.7 Blynk App

METHODOLOGY:

The NodeMcu (micro-controller) in the block diagram above is already linked to the Blynk app on a smartphone through WiFi and is used to control actuators like relay modules and water motor pumps by interpreting data from sensors including soil moisture sensors, DHT11 sensors, and pH sensor Board. To work continuously, this entire circuit is connected to the power supply. The Power supply and the sensor interfacing with the Node MCU is very crucial and it must be kept in check time to time .So that the data is transferred without any failure and the soil status is monitored correctly.By monitoring the soil data like humidity,temperature,moisture level and the pH level we can assess the farming Conditions.

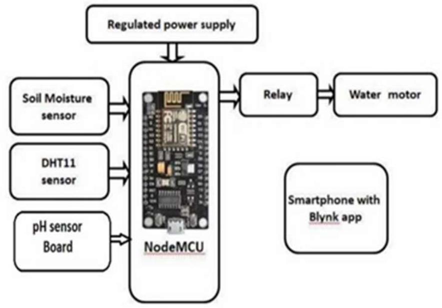


Figure 1.Block diagram of the System

FLOWCHART:

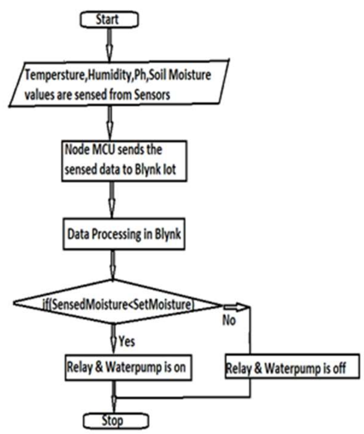


Figure 2.Flowchart of the System

CIRCUIT DIAGRAM:

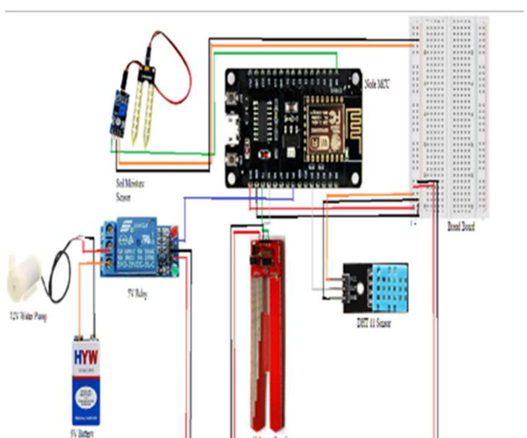


Figure 3.Circuit Implementation

- **Hardware setup:**

Connect the NodeMCU board to the computer and upload the required code. Connect the soil moisture sensor to the NodeMCU board's analog pin to read the analog signal. Connect the pH sensor board to the NodeMCU board's analog pin to read the pH value. Connect the temperature sensor to the NodeMCU board's analog pin to read the temperature signal. Connect the relay module to the NodeMCU board's digital output pin and the water motor pump to the relay module. Ensure the NodeMCU is connected to the Wi-Fi network to allow communication with the Blynk app.

- **Blynk app setup:**

Download and install the Blynk app on your smartphone. Create a new project on the Blynk app and select the NodeMCU as the hardware device. Add a gauge widget to display the soil moisture level, a button widget to control the water motor pump, a virtual pin to display the temperature value, and a graph widget to display the pH level. Get the auth token generated by the Blynk app and add it to the NodeMCU code.

- **Code implementation:**

Read the soil moisture sensor value continuously using the analog input pin of the NodeMCU board. Send the soil moisture value to the Blynk app using the Blynk.virtualWrite() function. Read the temperature sensor value continuously using the analog input pin of the NodeMCU board. Send the temperature value to the Blynk app using the Blynk.virtualWrite() f unction. Read the pH sensor board value continuously using the analog input pin of the NodeMCU board. Send the pH value to the Blynk app using the Blynk.virtualWrite() functionRead the pH sensor board value continuously using the analog input pin of the NodeMCU board. Send the pH value to the Blynk app using the Blynk.virtualWrite() function. Set a threshold value for the soil moisture level, pH level, and a temperature range to determine when the system should turn on the relay module connected to the water motor pump. When the button widget on the Blynk app is pressed, the Blynk app will send a command to the NodeMCU to turn on the relay module. Wait for a certain amount of time to allow the water to reach the plants Turnoff the relay module to stop the water motor pump. Send the status of the water motor pump to the Blynk app using the Blynk.virtualWrite() function.

Use a real-time clock (RTC) module to automate the irrigation schedule and set specific times to turn on and off the water motor pump. Set up push notifications on the Blynk app to alert you when the soil moisture level or pH level is too low or when the water motor pump is turned on or off. Analyze the soil moisture, pH level, and temperature data over time to adjust the threshold values and optimize the irrigation schedule.

RESULTS:

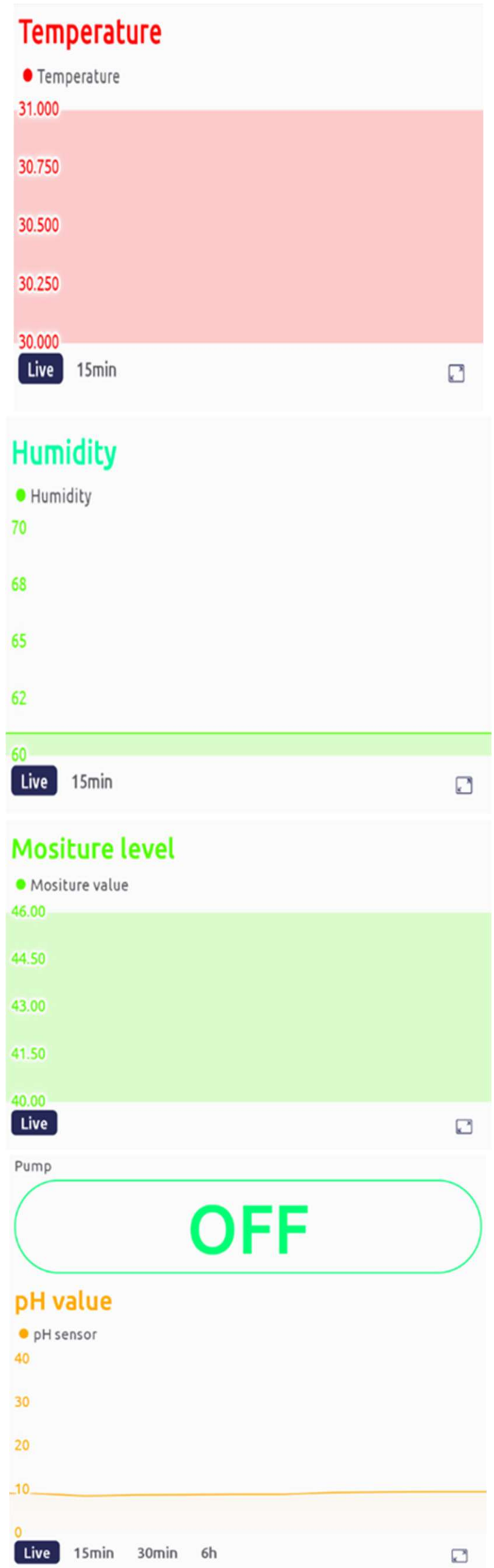
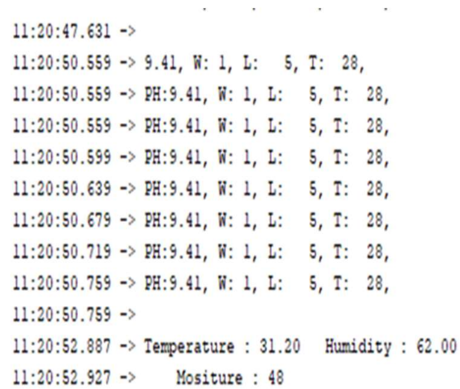


Figure 4 Blynk App outputs



```
11:20:47.631 ->
11:20:50.559 -> 9.41, W: 1, L:   5, T:  28,
11:20:50.559 -> PH:9.41, W: 1, L:   5, T:  28,
11:20:50.559 -> PH:9.41, W: 1, L:   5, T:  28,
11:20:50.599 -> PH:9.41, W: 1, L:   5, T:  28,
11:20:50.639 -> PH:9.41, W: 1, L:   5, T:  28,
11:20:50.679 -> PH:9.41, W: 1, L:   5, T:  28,
11:20:50.719 -> PH:9.41, W: 1, L:   5, T:  28,
11:20:50.759 -> PH:9.41, W: 1, L:   5, T:  28,
11:20:50.759 ->
11:20:52.887 -> Temperature : 31.20   Humidity : 62.00
11:20:52.927 ->     Mositure : 48
```

Figure 5 Serial Monitor Results

Hardware motor-ON:

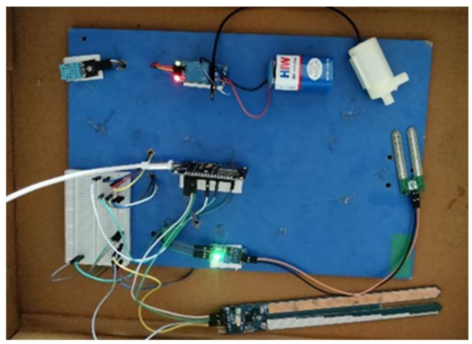


Figure 6 Harware when motor is on

Hardware motor-OFF:

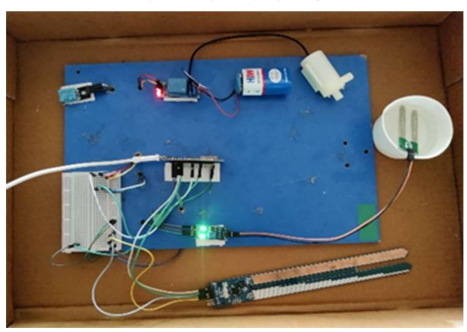


Figure 7 Hardware when motor is off

Conclusion:

The use of agricultural networking technology is essential for the growth of modern agriculture, but it is also a key indicator of how far agriculture will advance in the future and will go in that direction. Applying the internet of things to highly effective and safe agricultural production has a significant impact on ensuring the efficient use of water resources as well as the efficiency and stability of the agriculture, after building the agricultural water irrigation system hardware and researching and analysing the network hierarchy features, functionality, and the corresponding software architecture. These solutions may be more effective, considerably faster, and less expensive if IoT technology continues to progress in the upcoming years. Future developments in technology, such as the Internet of Things (IoT), will allow for the creation of an intelligent agricultural system that can operate independently of people and produce high-quality crops in large quantities. This system will be able to anticipate user actions, rainfall patterns, harvesting times, and animal intrusions into the field.

FUTURE SCOPE:

To transform the once fragmented and expensive robotics and microprocessor market into the dominant platform, partly as a result of its far cheaper cost and ease of use, which has increased its volume and popularity and the backing of the community.

NodeMcu (microprocessor) will give the better environment with the sensors and actuators. Finally apart from the Agriculture,it can be used forGardens, Smart cities development.

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