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Research Article

IoT BASED SMART IRRIGATION FOR AGRICULTURAL FIELDS USING SENSORS AND NODE MCU ESP8266 WI-FI MODULE

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ABSTRACT

India is the second-largest irrigated country, but only one-third of the area is irrigated. It is due to uncertain rainfall and lack of water. Most of the areas need canals to be built for irrigation without being depending on the rainfall. The utilization of water is very important for irrigation. The implementation of IoT agriculture starts with intelligent irrigation for the majority of fields. Optimizing the water schedule and quantity of water helps us to save water, money, and have the best crop on the field. Sensor-based IoT technology gathers soil moisture, temperature, humidity data, and transmits this information to farm irrigation systems from sensors. A platform responds to these signals and the drip irrigation switches on as soon as there is insufficient water in the soil. Our research is designed to overcome the problem of irrigation by reducing the usage of water while watering the plants. The proposed system uses sensors like a temperature and humidity sensor. The microcontroller is used to send data to web server is used to monitor the data, and web server is used to store the data. This system provides a feasible monitoring platform and automates the irrigation process. This leads to a transition from traditional farming to modern farming. Over 74 years since independence, India has made immense progress towards agriculture. In our system, we will use Node MCU ESP8266, DHT11, IoT based devices, open source Arduino Software and web server for implementation of proposed technique.

Keywords: IoT, NodeMCU , ESP8266, DHT11.

INTRODUCTION

The proposed system is used to automate the process of irrigation. Node MCU ESP8266 microcontroller is used to read data from sensors like Temperature and Humidity. This system continuously gets data from sensors using a microcontroller and connects with the web Applications and the cloud to send data. The data is read by the Node MCU microcontroller and with the help of the WIFI module built in it, it sends the data to web server. This data can be displayed using the web Server, which is available in both Android and Windows IOS. Relay is connected with a microcontroller to turn on/off the motor for irrigation automatically whenever the threshold is reached.

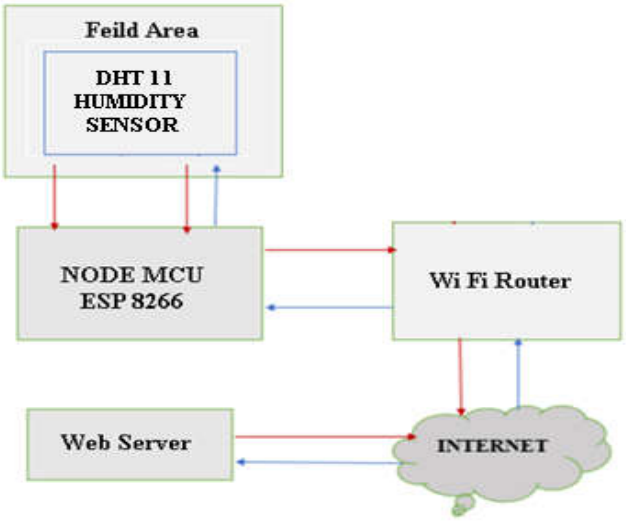

Fig: 1: Block diagram of Proposed System

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TEMPERATURE AND HUMIDITY SENSOR: DHT11

Temperature and humidity sensor are used to read both temperature and humidity values. It has a capacitive humidity sensor and a thermistor-based temperature sensor to measure the ambient temperature and humidity. It consists of three pins VCC, GND to Power, and Data(I/O) - Digital serial Data Output.

Fig. 2: DHT11 Humidity and Temperature Sensor Module

ESP8266 WI-FI MODULE

It is a low-cost independent device used for the wireless connection that can be applied to develop the endpoint Internet of things. It enables internet connections to integrated applications. ESP8266 use TCP/UDP communication protocol to connect with server/client. Microcontroller use set of an AT commands and specified Baud rate (Default 115200) to communicate with ESP8266.

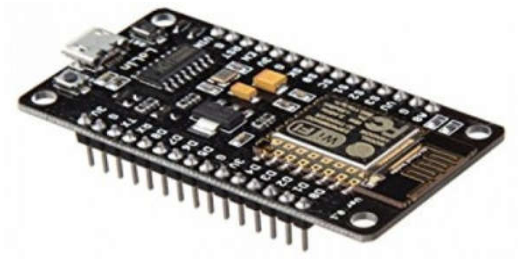

Fig. 3: NODEMCU - ESP8266 WiFi Development Board

INTERFACING DIAGRAM

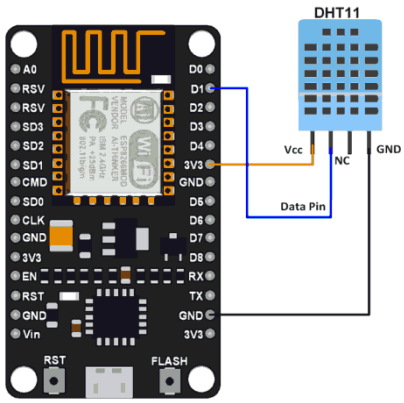

Fig. 4: Node MCU interfaced with DHT11

Table 1: Specification of a System

Item	Specification
NodeMCU ESP8266	ESP-8266 32-bit, Operating Voltage- 3.3V, Input Voltage- 4-10V, Flash memory- 4 MB/64 KB
Development Platform	IA-32, x86-64, ARM
DHT11	Humidity Sensor
Language Used	Arduino C++
Code Development	Arduino Software

WEB SERVER

A web server is computer software and underlying hardware that accepts requests via HTTP, the network protocol created to distribute web pages, or its secure variant HTTPS. A user agent, commonly a web browser or web crawler, initiates communication by making a request for a specific resource using HTTP, and the server responds with the content of that resource or an error message. The server can also accept and store resources sent from the user agent if configured to do so

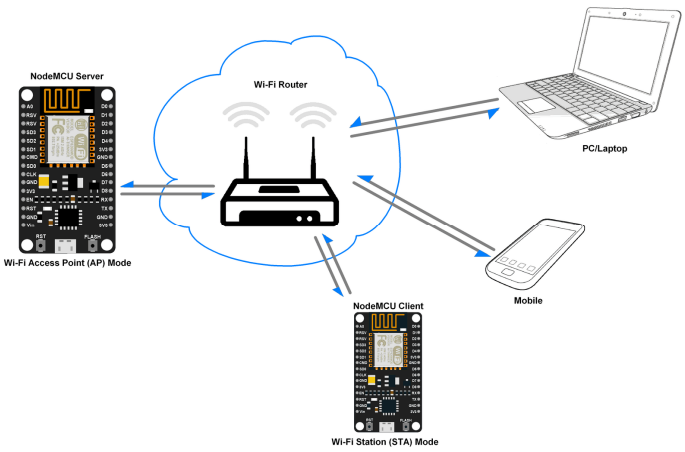

Fig. 5: Node MCU ESP8266 TCP Web Server

RESULTS AND DISCUSSION

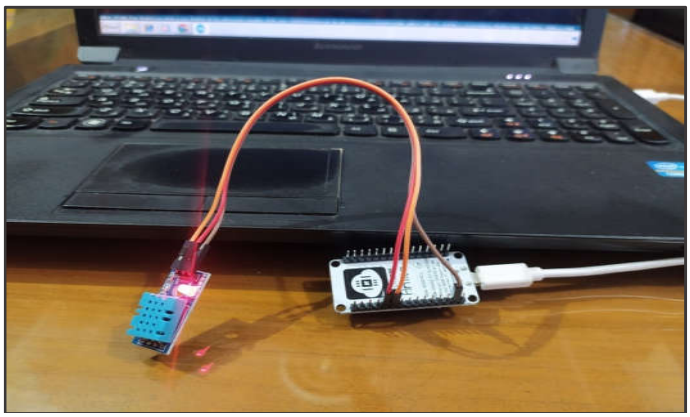

Fig. 6: Assemble DHT11 Sensor, Node MCU ESP8266, WiFi Router with webserver for collect live humidity and temperature data.

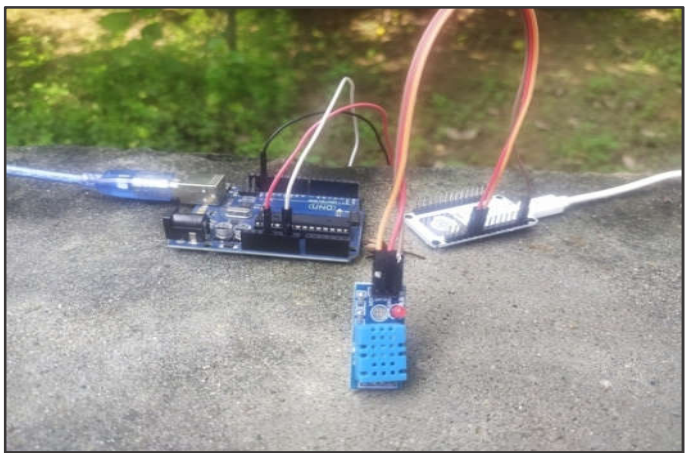

Fig.7: Collect Live Temperature and humidity data from Agriculture fields with the help of IoT devices.

Table 2: Analysis Between the Values of Humidity And Temperature Data Collected By Proposed Technique And Analog System.

Digital Humidity	Analog Humidity	Analog Temperature	Digital Temperature
64.00	74	31	30.00
64.00	73	32	30.00
64.25	74	31	30.89
64.75	67	31	31.00
63.00	56	32	29.55
62.23	60	32	29.55
63.00	62	29	29.55
64.00	63	29	30.00
64.75	61	30	31.00
64.66	66	33	30.58
64.55	65	33	30.58
62.00	54	33	29.63
62.52	64	34	29.23
62.89	63	34	29.23
62.78	61	30	29.23
63.25	69	29	29.66
63.45	66	31	29.66
63.56	59	32	29.66

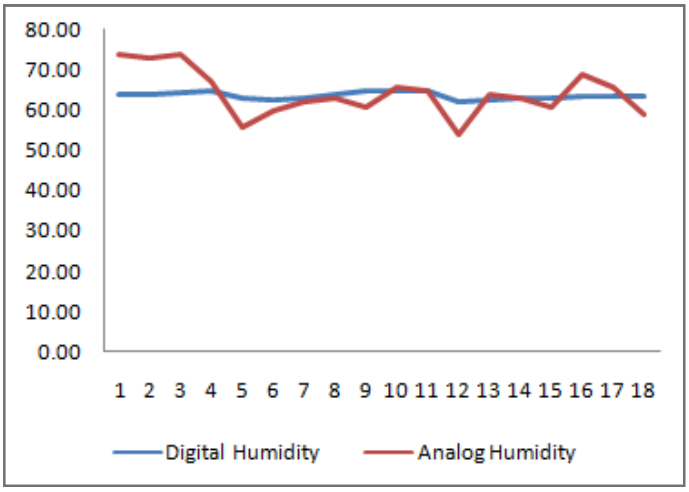

Fig. 8: Comparison Between the Values of Humidity Data Collected By Proposed Technique And Analog System.

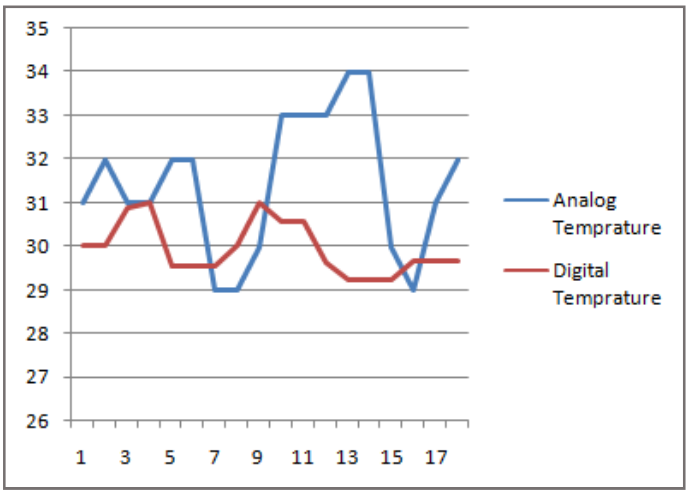

Fig. 9: Comparison Between the Values of Temperature Data Collected By Proposed Technique And Analog System.

CONCLUSION

It's a digital sensor used to measure weather in the field. It gives a digital output value, so we can transfer these outputs directly to Node MCU ESP8266 for making a decision to achieve suitable climate by controlling water. DHT11 has a capacitive sensor that measures humidity. This sensor has an only real flaw that can get the updated data from it only after every 2 seconds. Its reliability is highly ensured along with an excellent stability. This sensor measures the amount of water in the environment using its electrical resistance properties. The relationship between this measured property and the humidity is analyzed and varies according to different environmental conditions like temperature and humidity or the extent of its connection to the electrification. Here, it is applied to measure moisture in the soil of the field and transfer it to Node MCU to make a decision to control the operation or extinguishing of the water pump.

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