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Research Article

Enhancing Smart Irrigation with IoT: A Node MCU ESP 8266 Wi-Fi Module Approach

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A B S T R A C T

The Internet of Things, or IoT, is a term that refers to the number of physical devices that are linked together via the internet. To use sensors to connect various objects and communicate without the need for individual beings. India is the world's second-largest irrigated nation. Because of the unpredictability of rainfall and the scarcity of water, irrigation requires a lot of water. Crop production has been impacted by climate change and groundwater depletion. We can save resources and money with the help of IoT and sensors. An examination of the extent of spruce irrigation working IoT and sensors is explained in this analysis. Different parameters, such as soil moisture, soil temperature, humidity, have been combined using an IOT platform and a wireless communication system to create PH. The data is sent using a microcontroller.

Keywords: IoT, Internet, Irrigation, Humidity, Microcontroller

Introduction

Agriculture is greatly impacted by the problem of water scarcity. Water setting is therefore necessary during assembly. The entire farming system in India is coordinated. Farmers must frequently monitor the amount of water needed for their land. It takes a considerable lot of time and work. Crop growers will spend the entire day sprinkling in their fields. But modern farmers need to balance their agricultural endeavours with other businesses. As a result, agriculture has grown more automated. A sensor-based automatic irrigation system makes it unnecessary for the farmer to be on the field. There will be a mobile application accessible for this purpose. Using a smartphone app, the farmer may monitor the temperature and moisture of the field. To ascertain whether the soil is wet or dry, a soil moisture sensor is employed. An advanced Internet of items network is developed when a person needs to connect to other items. The Iot is employed to spark innovation and foster development. A clever précis called "astute sprinkling" has caught the attention of numerous analysts. Modern irrigation primarily aims to cut back on electricity, water, pool usage. Beyond human awareness, a highly sophisticated sprinkler system regularly waters plants using aromatics and a sensor. The project's primary goal is to develop the sprinkler system that will distribute all above-average materials. Using the internet, the irrigation system may be managed from any location. The setup's second goal is to inform the farmer in advance of any disastrous circumstance and suggest crop reform. Recognising temperature enables testing of both the crop temperature and the ambient temperature.

Survey of Literature

The smart irrigation system was created by Sukanya Deskin, T.Sangavi, Sheena Mohan, A. Soundharya. The farmer can choose to use an irrigation system that is manually regulated. Water loss results from the task's reduction of the water supply. Dry regions with little rainfall are challenging for irrigation. The quantity of water demand in the fields must therefore be precisely controlled and monitored by an automated system. to suggest a cutting-edge irrigation system powered by the Internet of Things that conserves time and water. Microcontroller and MCU ESP8266 Wi-Fi module that increases system longevity by consuming less power.[1]

Using MQTT Concord, Ravi Kishore Kodali and Borade Samar Sarjera can coeval a low-cost contemporary irrigation setup.

The objective was to use an ESP 8266 and a Node MCU-12 E to build a straightforward water pump controller based on a soil moisture sensor that may be used in the agriculture department.

The Node MCU-12 E is a luxurious system with a little microcontroller and less power consumption, making it perfect for the task at hand.[2]

An Arduino-based smart irrigation system was demonstrated by Pushkar Singh and Sang Amrita. The job, application, maintenance, terminologies were all covered by an Arduino-based translation. This tool is incredibly stable and simple to use. The user can be even more creative thanks to sensors that mesh along the website's contact system from a vast distance in nanoseconds. It is an expensive microcontroller that may be used over a huge region for only a minor investment.[3]

A contemporary water dripping method for agriculture was introduced by Priyanka Padalalu, Sonal Mahajan, Kartikee Dabir Sushmita Mitkar, Deepali Javale. It sways and keeps a close eye on the confreres' water. Model sway and precise water monitoring are inevitably important in the field. This model's microcontroller has the power to extend the system's lifespan and power efficiency. In developing nations like India, the water dripping system, which employs a contemporary composition for adequate water exertion, is a significant problem. An Android operating system manages the complete setup.[4]

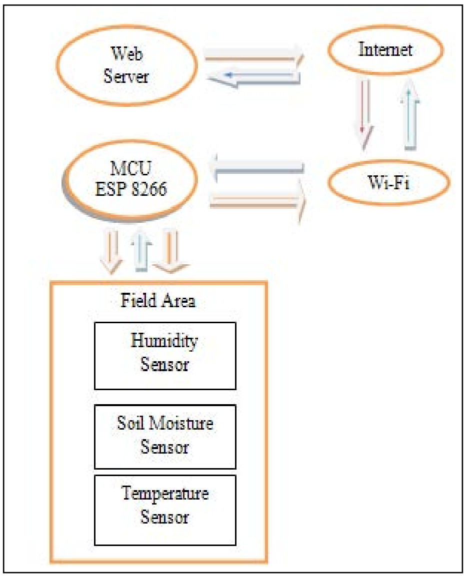

Figure 1.Block diagram of prospective system

Proposed Methodology

The sprinkling procedure is automated using the suggested set-up. To read data from the sensor MCU, the ESP8266 microcontroller is worn. The system's microcontroller communicates to the web application after receiving sensor input. A web server can be used to show data. Every time the brink is captured to turn On/Off, the motor is actually used to sprinkle naturally.

Sensor for temperature and humidity: DHT 11

Temperature and humidity sensors are the most typical environmental sensors employed. These items are also known as hygrometers. It offers the air's current humidity at any location. These devices are frequently utilised in situations where air conditioning is required to be composed because of a changing environment or where air conditioning is predicted to be severe. It contains a capacitive humidity sensor and a fixed thermostat temperature sensor for measuring the ambient temperature and humidity. The pins are labelled VCC, DATA, GND.

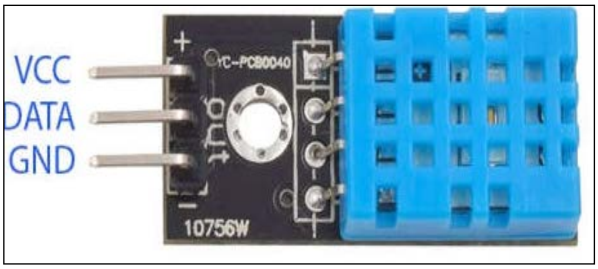

Figure 2.Block diagram of Prospective System

A tool that measures soil moisture is the Soil Moisture Sensor.

To determine the volumetric amount of water inside the soil, a soil moisture sensor is worn. The orb contains a sensor that allows the percentage of water satisfied to be recorded. The voltage output of the sensor varies in direct proportion to both the water content and dielectric permittivity. The sensor's integrated range can be purchased for a reasonable cost. various crops needed various amounts of moisture to yield more. Given that water is scarce, we should consider how much water is now available on the farm after accepting these moisture values.[5]

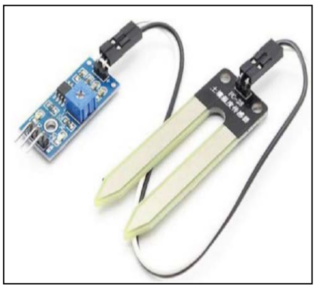

Figure 3.Sensor of Soil Moisture.

Bluetooth Module ESP 8266

An ESP 8266 Wi-Fi SOC microchip is used to construct the end point of IOT operation. It is a wireless communication device that is non-partisan. TCP/IP protocol is used to establish connections with servers and clients.

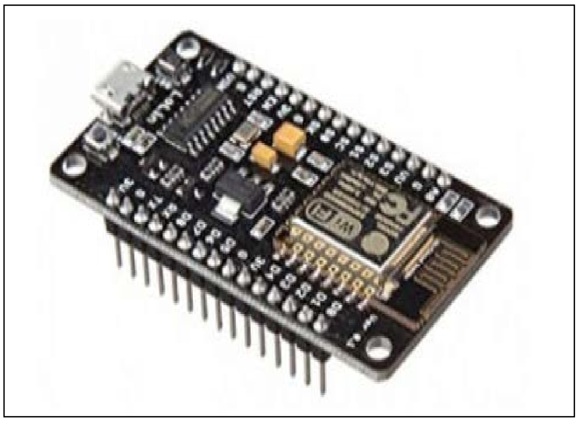

Figure 4.ESP 8266 Wi-Fi development board

DHT 11 Sensors Interfacing with Node MCU

DHT 11 sensor used to implement humidity and temperature readings serially over a single wire. It can measure temperature in degrees Celsius and relative humidity in ratio. Four pins are employed in the sensor for serial transmission. T ON and T OFF pulses are encoded as logic 1 or logic 0 at the beginning and end of the frame, respectively.

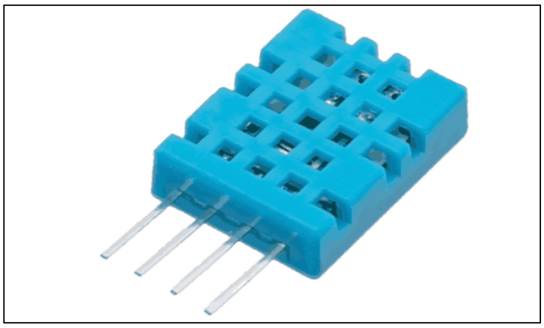

Figure 5.DHT11 Temperature and humidity

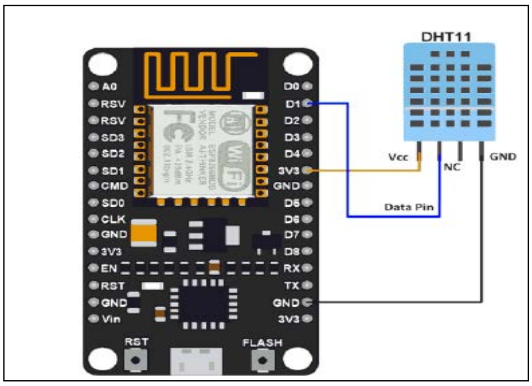

Figure 6.NodeMCU interfaced with DHT11

System Depiction

Arduino Microcontroller is the system's intelligentsia component. It can be used for a variety of electronic prototypes for designing, developing, testing with hardware and software.[6] Arduino mesh among website visitors. A server is set up that can work with the ESP 8266 Wi-Fi Module to receive input and transmit it to the website.

Table 1

Item	Specification
Node MCU	ESP-8266 ,operating 32 bit, voltage -3.3V
DHT 11	Temperature and humidity sensor
Code Development	Arduino Software
Language	Arduino C++

Result and Analysis

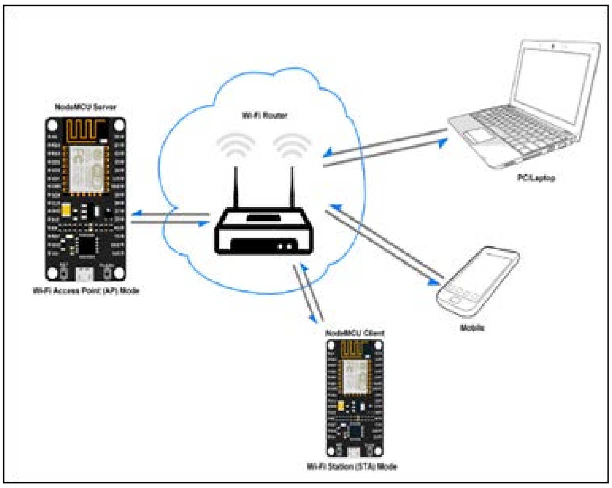

Figure 7.Node MCU ESP 8266 TCP Server

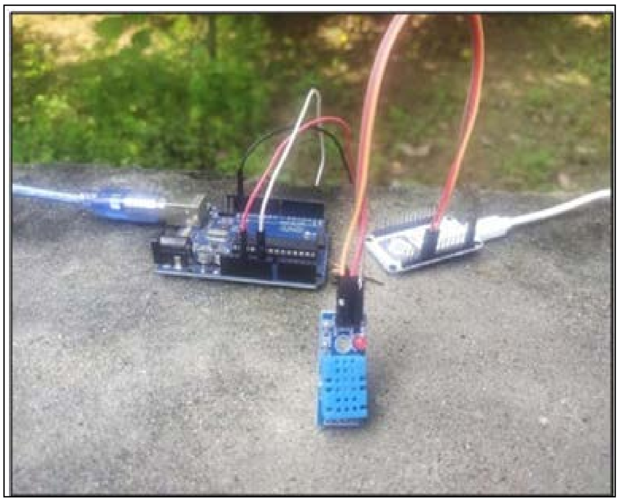

Figure 8.Compile Temperature and Humidity input from agriculture with the help of IoT

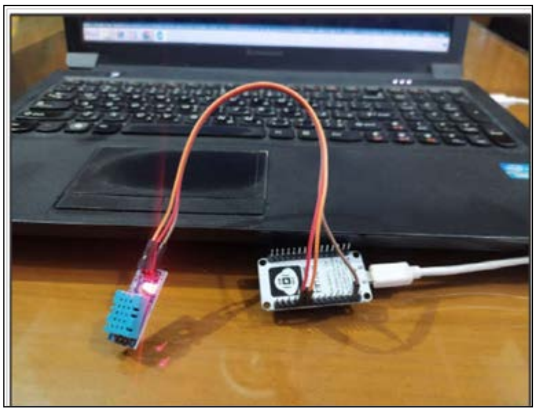

Figure 9.Connect DHT11 Sensor, Node MCU ESP8266, Wi-Fi router with web

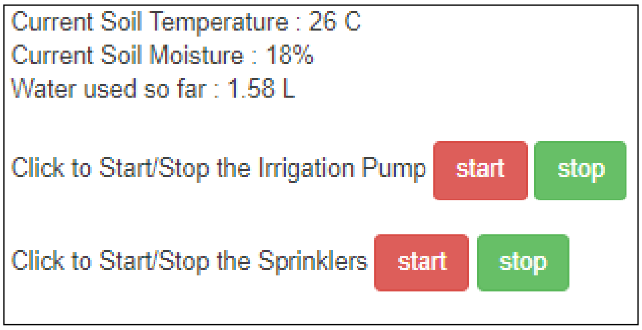

Figure 10

Table 2.Study between the values of humidity and temperature data amass by prospective mode.

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

Conclusion

Farmers flood their land at a specific period and use manly irrigation. It causes significant water pollution, which causes a water deficit. Irrigation is effective where rainfall is reduced. The ESP 8266 Wi-Fi based gearbox system has been halted because of how simple, inexpensive, easy to maintain it is. Because digital sensors generate digital output values, we can accurately convey these findings to Node MCU ESP 8266 for the preparation of a decision to establish an appropriate climate by restricting water. It is possible to measure quota-related humidity, moisture, temperature using a strange humidity, moisture, temperature sensor. Electrical resistance qualities can be used to measure the amount of water present. It is considered that there is a relationship between this constant value and humidity, that relationship varies with the distribution's size and external variables like temperature and humidity. Due to the service being reduced, it is necessary to limit moisture in the field's soil and relocate it to Node MCU.

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