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DYNAMIC WATER IRRIGATION SYSTEM USING NODE MCU

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ABSTRACT

India is a growing country in every aspect from population to the water consumption. So to overcome the efforts of the man power and to save the water from being wasted. This project propose implementation of Dynamic Water Irrigation System to water the plants and crop field in smart way without any human efforts. Indian economy has major contribution in agriculture sector by upgrading the irrigation system and by making it autonomous using parameters such as (Soil, Temperature, Humidity) provided by the sensors and controlled by the controllers such as node MCU, and also the system / prototype is monitored with the help of Wi-Fi connectivity system can be used by domestic / commercial purpose.

Keywords: Node MCU, Wi-Fi, Sensors, IOT, Automation.

INTRODUCTION

India is an agriculture-based nation. It is necessary to improve the productivity and quality of agro-based product for the modernization of Indian agriculture. A lot of research is being carried out in this domain. The most recent developments give us an insight into how this works. To measure the content of water in the soil, the soil moisture sensor is placed in the crop field. Here the temperature sensor is used to measure the temperature in the atmosphere. Proposed system automatically irrigate the fields when the water level is lower than a set of threshold value.

Using electrochemical pumps, the efficiency can be increased, and most of them operate at a uniform speed and do not adapt to functional changes. Frequency and speed are electromechanically integrated to design an intelligent device. This system greatly enhances irrigation uniformity. The proposed design must also include an automatic system that aids farmers in irrigation process, where they are continuously monitor the moisture level of crops by using the internet module (Node MCU).

BACKGROUND

The economy of many countries depends on agriculture. For the best quality of the crops from the research, it is necessary to focus on the characteristics such as amount of electricity as well important to focus on some important characteristics such as the appropriate amount of electricity as well appropriate as well as water supply which is suitable for irrigation of crops.water supply and a suitable schedule for irrigation of crops. In previous generation the irrigation system used to be operated manually be the farmer. Because for that the

farmer were facing various problems while meeting these standards.This project looks forward in developing and automatic irrigation system that could be controlled by the mobile application.This system will work to minimize the number of workers in a in a crop field, control and save water, detect the content of soil as well as it will detect the temperature into the atmosphere. In this way we can increase agriculture production using small quantities of water.

LITERATURE SURVEY

Traditionally, Agriculture/Irrigation was done manually by the farmers. However, primary investigation is carried out under the following stages, such as understanding the existing approaches, understanding the requirements, developing an abstract for the system. The main purpose of this project is to develop an automatic system that solves the problems which are related to irrigation and agriculture system. An automatic irrigation system was developed to optimize water use for agriculture crops. The system is distributed in wireless networks such as soil moisture and temperature sensors which are placed in the root zone of the plants. The soil moisture sensor, temperature and water level transmits the data to android application. This project is more useful in in agricultural for watering the plants automatically without any human interference.

A. Related Work

- R. Vagulabranan[1], Sasikala et al. introduce paper on "Automatic Irrigation System onSensing Soil Moisture Content" In2016 whichwas intended to create an automated irrigation mechanism which turns the pumping motor ON and OFF on detecting the dampness content of the earth. In this paper only soil moisture value is considered but proposed project provided extension to this existed project by adding temperature and humidity values.
- P. Sindhuja[2], M.Pathusha " Solar Driven Arduino Based on Automatic Irrigation using GSM" this system made use of GSM to control the system which may cost more so to overcome that proposed system used arduino board which already consist of in build Wi-Fi module.
- J. Ashok[3], M.Dhanesh Kumar et al. Designed a project named "A Study on Microcontroller Based Automatic Real Time Water Irrigation Management System" In this paper old generation with lesser memory microcontroller is used to control the system but proposed system made use of arduino UNO board which is user friendly and it helps to dumps the programs easily.
- AshikaPremkumar[4], PadmapriyaPraveenkumar Designed a project on "IoT Assisted Automatic Irrigation System using Wireless Sensors Nodes" in this project the proposed methodology by using arduino for moisture sensing and controlling the water supply and node Microcontroller Unit (MCU) for notifying the status of the irrigation system to the farmers through Mobile Communication.

PROPOSED METHODOLOGY

Block Diagram of Dynamic Water Irrigation System using Node MCU

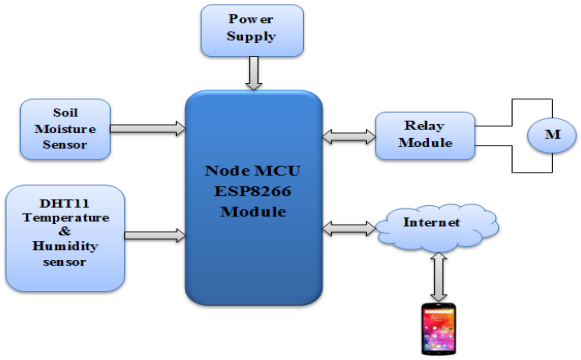

Figure 1: Block diagram of Dynamic Water Irrigation System

1. Soil Moisture Sensor

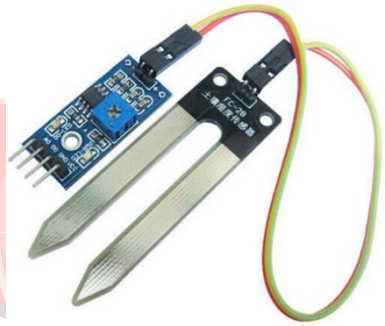

Figure 2: Soil Moisture Sensor

A simple soil moisture sensor is used for farming purpose. Soil moisture sensor measure the volumetric of water content in soil. The soil moisture sensor requires drying, removing, and weighting of a sample, soil moisture sensors measure the water content by using the other property of the soil, such as electrical resistance and dielectric constant as a proxy for the moisture content.

2. DHT11 Temperature and Humidity Sensor

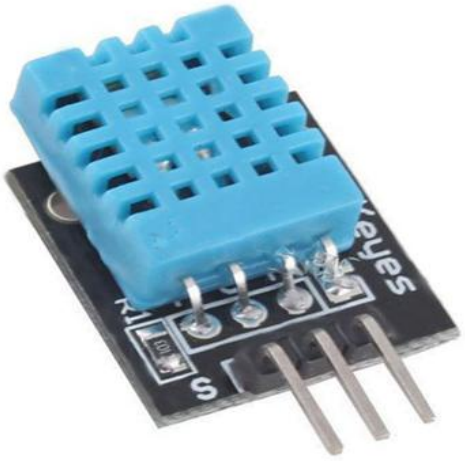

Figure 3: Temperature & Humidity sensor

This DHT11 sensor features a calibrated digital signal output with the temperature and humidity sensor capability. The technology ensures that it has high reliability and excellent long-term stability. The DHT11 sensor are also have a resistive element and a sensor to check wet NTC temperature measuring devices.

DHT11 Specifications:

- **Operating Voltage:** 3.5V to 5.5V
- **Operating Current:** 0.3mA (measuring) 60uA (standby)
- **Output:** Serial data
- **Temperature Range:** 0°C to 50°C
- **Humidity Range:** 20% to 90%
- **Accuracy:** ±1°C and ±1%

3. Node MCU ESP8266 Wi-Fi Module

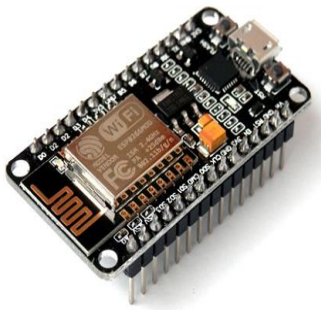

Figure 4: Node MCU ESP8266 Wi-Fi Module

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Node MCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC (System on a Chip) from Expressive Systems, and hardware which is based on the ESP-12 Module.

The firmware uses the Lua scripting language. The programming code is being written for ESP8266 Wi-Fi using Arduino IDE, for which installation of ESP8266 library is required.

4. Relay module

Figure 5: Relay Module

It is used to control the actions of the motor and gives the signal to the Node MCU according the moisture level of the soil. A relay is an electrically operated switch. There are so many relays use an electromagnetic to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. The circuit are controlled by the relay module which seperates the low power signal, or some of the circuits are controlled by one signal.

A. ALGORITHM

// get_soil_moisture_data(): Get the soil moisture data using the Soil Moisture Sensor.

// get_temperature_data(): Get the temperature data using the DHT11 Sensor.

// get_humidity_data(): Get the humidity data using the DHT11 Sensor.

// A 1 second delay is used between sensor data refresh to ensure that the sensor do not work at high clock rate.

Step 1: Connect Node MCU ESP8266 Module to the internet

Step 2: Initialize connection with the user's mobile device

Step 3: While True: // Keep the loop running until the power supply is on

Step 4: moisture = get_soil_moisture_data()

Step 5: temperature = get_temperature_data()

Step 6: humidity = get_humidity_data()

Step 7: IF moisture <MOISTURE_ THRESHOLD_LEVEL:

// Relay module will turn on DC water pump

Step 8: turn_on_relay_module()

Step 9: END IF

Step 10:ELSE:

// If moisture level is in acceptable range, turn off the DC water pump

Step 11: turn_off_relay_module()

Step 12: END ELSE

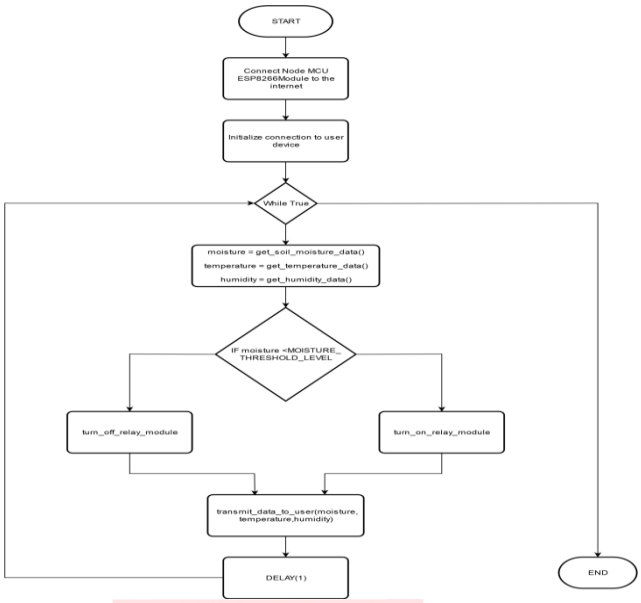
Step 13: transmit_data_to_user(moisture, temperature, humidity)

Step 14: Delay(1) // Wait for 1 second before refreshing sensor data

Step 15: END While

Step 16: END

B. FLOWCHART



RESULT ANALYSIS

With Dynamic Water Irrigation System using Node MCU the Irrigation System becomes more easier, Accurate by using the Different Sensors like Soil Moisture which measures the Soil content in the Agriculture field, while the Temperature and Humidity Sensor measures the Temperature and Humidity into the Atmosphere. By implementing this idea the Following results are achieved as:

Upgradation in Speed	As Previously irrigation used to be done Manually but in this Project the Agriculture field is Irrigated Automatically by this the speed in increased
Cost	It has low cost as the project has been implemented on Node MCU ESP8266
Energy Efficiency	It reduces the human power and also requires less time.
Water	As it is an Automatic Irrigation System by which one can save huge amount of water and there will be no water scarity.
Number of Sensors	As our project is implemented on different Sensors like Soil Moisture, DHT11 Temperature and Humidity Sensor it Measures various Parameters at one Time.

CONCLUSION

The basicapplications for this project isfor farmers and gardeners who do not have enough time to water their crops/plants. The project can also be implemented in greenhouse where manual supervision is far and few in between. Through the internet/Wi-Fi control the motor in the field. This will help the user to analyse the conditions of parameters in the field anytime anywhere. Then control or maintain the parameters of field properly. The principle can be extended to create fully automated gardens and farmlands. Finally, we conclude that automatic irrigation system is more efficient than scheduled irrigation process.

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