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A Review on Smart Plant Monitoring System Using IoT

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Abstract

India is well known for agriculture and irrigation is the heart of farming. It is very important to look after the irrigation factor. To have a good cropproductivity as well as quality, it is very essential to have a proper water supply. Checking the need for water supply manually becomes difficult as we can't predict the humidity, and moisture content in the soil, thus decreasing the crop quality. This automated irrigation supply will givethe moisture and humidity content through an application named as **Blynk,** allowing us to control the water supply using this application. Farmers are facing various problems regarding the irrigation required for farming. This system will be helpful to monitor the crop growth as well as to save water. Additionally, it will help to predict the current plant condition based on the sensor readings. This data is accessible on the cloud platform which can bemonitored from any location.

1. INTRODUCTION

India is one of the largest freshwater users in the world, and our country uses large amount of fresh water than other country. There is a large amount of water used in agriculture field rather than domestic and industrial sector. 65% of total water is contributes as a groundwater. Today water has become one of the important sources on the earth and most of used in the agriculture field. As the soil- moisture sensor and temperature sensor are placed in the root zone of the plants, the system can distribute this information through the wireless network. The NODEMCU is the heart of the system. Arduino programming language is used for automation purpose. The system is a network of wired sensors and a wireless base station which can be used to provide the sensors data to automate the irrigation system.The system can use the sensorssuch as soil moisture sensor and soil temperature sensor and also ultrasonic sensor. The NODEMCU model isprogrammed such that if the either soil moisture or temperature parameters cross apredefined threshold level, the irrigation system is automated, i.e., the relay connected to the NODEMCU (ESP8266) will
turn ON or OFF the motor. This paper presents an efficient, fairly cheap and easy automated irrigation system. This system once installed it has less maintenance cost and is easy to use. By using the webcam with suitable application on mobile phone we can easily online monitoring the actual situation of the field and sensors such as soil moisture and temperature are used to provide the information about changesoccurs in the field. It is more advantageous than the traditional agriculture techniques.

2. LITERATURE REVIEW

[1] A. Pravin, T. Prem Jacob and P. Asha developed a module which enhanced the plant monitoring using IOT. They mainly focus on collecting the information from the field. The sensors devices can be used for collecting the information. The type of sensors that can be used are soil monitoring sensor, light sensor and temperature sensor. The temperature sensor will give the temperature details, the water content in the soil can be measured by using the soil monitor sensor and the light sensor is used to measure the field light intensity **[2]** Monirul Islam Pavel, Sadman Sakib Hasan, Syed Mohammad Kamruzzaman and Saifur Rahman Sabuj propose IOT enable device which sends environment data in real-time to the database along with image of plant leaf to classify diseases using image processing and multiclass support vector machine. Figure 1 describes our proposed model. Image processing has been implemented to detect and classify the affected plant disease. In this process, the work is divided into four portion which are image acquisition and pre- processing, segmentation of affected region, feature extraction,classification using multi-class support vector machine algorithm. All data of sensors are obtained by Arduino and stored in a string format. Arduino then sides the whole string to Raspberry Pi 3, and it split all data based on coma and again stored in array. Afterward, a Uniform Resource Locator (URL) is created with our data server's IP address with corresponding database column name of each sensor and the obtained values of sensor.

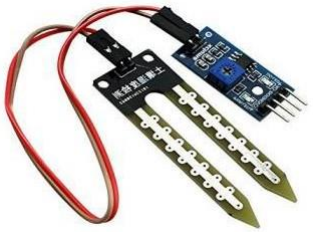
[3] Nivesh Patil, Shubham Patil, Animesh Uttekar, A. R. Suryawanshihave explained about Computers or mobile applications to control the system. In their system, every node is integrated with various devices, sensors and they are interconnected to one central server via wireless communication modules. Server role is to transmit and receives information from user end using internet connectivity. In system thereare 2 modes of operation; manual mode and auto mode. In auto mode system takes decisions automatic and controls the devices installed whereas in manual mode user has freedom to control the operations of system using PC commands or android app. Mentioning the trends and chances for development for IOT in farming rural and sector development. Analyzing the knowledge obtained and proposing right steps of confirmation by establishing correct prototypes of model solution for hardware parts and software of IOT.

PROPOSED SYSTEM

3.1 Node-MCU ESP8266: Node-MCU is an open-sourcefirmware for which open-source prototyping boarddesigns are available. The prototyping hardware typicallyused is a circuit boardfunctioning as a dual in-linepackage (DIP) whichintegrates a USB controllerwith a smaller surface-mounted board containing theMCU and antenna.

3.2 Soil Moisture Sensor: Soil moisture sensors measure the volumetric water content in soil. Sincethe direct gravimeter

measurement of free-soil moisture requires removing, drying, and weighing of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.



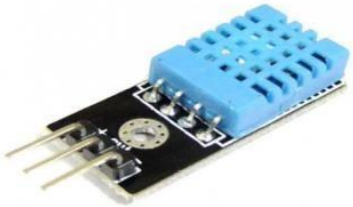
3.3 Relay Module:

Relay is an electromechanical device that uses an electric current to open or close the contacts of a switch. The single-channel relay module is much more than just a plain relay, it comprises of components that make switching and connection easier and act as indicators to show if the module is powered and if the relay is active or not.

3.4 Solenoid Water valve:

A solenoid dosing pump is a form of positive displacement pump which uses a diaphragm and solenoid assembly to displace the fluid into the discharge line. The solenoid 'drive' consists of an electromagnet and spring assembly, which is activated/deactivated with a series of electrical impulses.

3.5 DHT11 Temperature sensor: The DHT11 is a basic, ultra-low- cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). Its fairly simple to use, but requires careful timing to grab data.



3. Software Description:

4.1 Arduino IDE:

The Arduino Integrated Development Environment - or Arduino Software (IDE) - containsa text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

4.2 BLYNK App:

Blynk app is an open-source android application that can be used to build IoT applications in 5 minutes. It works with Arduino, ESP8266, ESP32, Raspberry Pi etc. It can be used to control these micro-controllers with the smartphone over the internet. Bluetooth and BLE is supported too.

4. WORKING METHODOLOGY

The system consists of two major sensors namely, DHT11-for measuring temperature and humidity and Soil Moisture sensor-for measuring the moisture content from the soil. The complete data is transmitted in the form of 32bits. Data format for the same is represented as: 8bit integral humidity data + 8bit decimal humidity data + 8bit decimal temperature data + 8bitcheck sum (Error bits). If the data transmission is right, the check-sum should be the last 8bit of "8bitintegral humidity data + 8bit decimal humidity data + 8bit integral temperature data + 8-bit decimal temperature data". Node- MCU acts as the microcontroller of the system where all the sensors are being connected to get the specific readings. This microcontroller is also given a 5V power supply for the efficient working of the valves and solenoid pump. Once the specified data is received, it is sent to the Blynk

application which will give the access to the data through any device.

The readings retrieved are in the form of bit values, thus to make them understand by common people it needs to be converted in percentage. The required conversion can be performed using mapping function.

int val = analogRead(A0); int

newVal = map (val, 1023, 0, 0, 100);

Where, 'A0', is the variable to store analog value coming from sensors. 'newVal', is the variable that stores the converted value in percentage (%). 'map()', is the actual function used for the conversion of bit value to percentage value.

The sensors measure the resistance which is calculated in the terms of bits which means 1023 bits resistance gives 0% soil moisture and 0 bits resistancegives 100% soil moisture.

5. HARDWARE OUTPUT

The hardware for this project includes NodeMCU as the heart of the system which acts as the microcontroller. We connect the soil moisture and humidity sensors through jumper wires toget the required input and it gives the output through the relay module. To get the results displayed we link the hardware to the IoT application named as blynk which is installed in android aswell as desktop. Thus, we can control the water flow using this application which helps to supply proper water and will also improvethe crop growth and quality.

6. SOFTWARE OUTPUT

The Blynk application gives the parameters for the soil moisture and humidity which helps to study the current condition of the plant. When the moisture content and humidity content give the readings below certain limit then it will be notified through this application. The water pump is started depending on thesereadings.

7. RESULTS

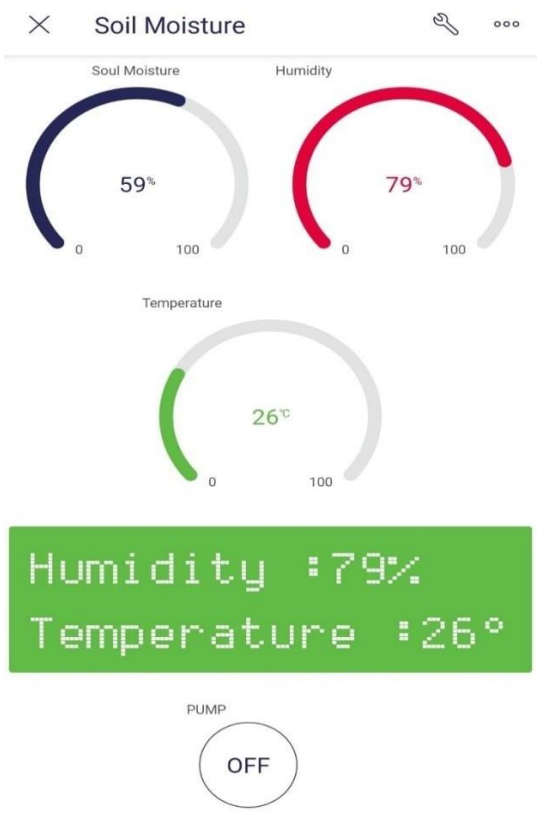


Fig: Blynk Dashboard

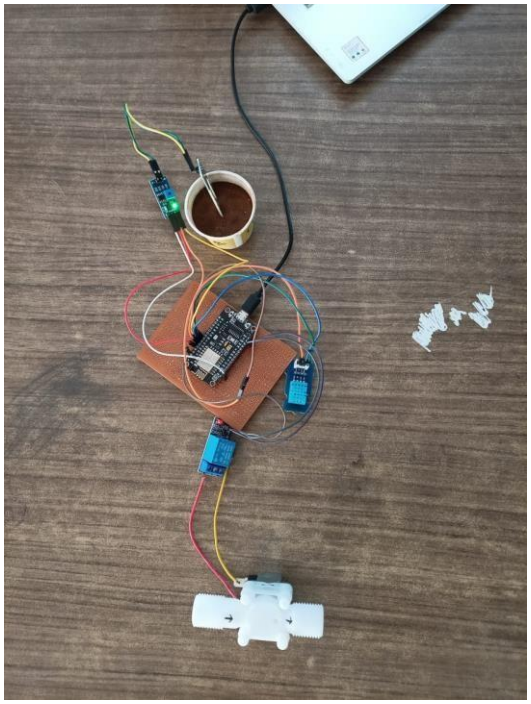


Fig:Hardware Connection

8. CONCLUSION

This system mainly focuses on two results; the first result is to help famers to upgrade their agriculture, technical knowledge and to act inaccordingly with minimum requirements on environmental issues and mostly the basic function being prevented by major disasters and protect plants and nature from being ruptured. The second result of our project is to use the technology to measure the humidity, temperatureand moisture of the plant root and make the plant grow in a well suitable environment. The farmer or the user receives the message regarding the status and thus helps in avoiding delay of plant watering and protect the plant to live in a suitable and healthy environment.

9. REFERANCES

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11. BIOGRAPHY

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