Implementation of Web Technology for Smart Farming Monitoring and Controlled using IoT Blynk App and NodeMCU esp8266

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ABSTRACT

At present, most of Thailand are engaged in agriculture. The major factor affecting plants is improper soil moisture content. Later innovations and technology were introduced to help in planning agriculture. The objective is to develop a real-time, low-cost sensor based data analysis system for measuring soil moisture spatially. To monitor the growth problems and increase plant yield through Internet of Things technology.

This paper presents about making farms smart and developed to help agriculture grow faster and safer. This paper expresses monitoring and controlling of parameters of the soil moisture. It contains controlling of solenoid valves using a blynk app with indication using NodeMCU ESP8266.The moisture sensors are strapped to the microcontroller. The Arduino software is used for getting the output of the sensors. These criterions are sensed by way of IoT to Blynk app.This Blynk app is used for controlling and monitoring the parameters of farms with different crops.

1. INTRODUCTION

Nowadays, most Thai people are farmers which is an important career for the economic system. According to the statistical data of Thai farmers from the Fiscal Policy Office, it reports that the area of Thailand is 320.6 million Rai, in 2018, 102.4 million Rai of forest, 149.2 million Rai of agriculture use, and 68.9 million Rai for other uses. It is obvious that most of the land of the country is used for agriculture. Later, there is a significant change of Thai traditional agriculture which depends on the weather. It became the era of Agriculture 4.0 in which changed from the traditional agriculture into agriculture integration with technologies and innovation to increase agricultural production. Technology and innovation are integrated into planting and management to control the process to achieve an accurate agriculture; for example, soil moisture sensor for planting environment data collection and to prepare for every condition. Since global climate change, farmers cannot predict any situations so the application of technology to increase production efficiency, reduce the long-term cost and errors from production by the farmers. It also increases the value and number of agricultural productions. Farmers can control everything through the internet which is the application of information technology for the most benefits of the users. There are also the uses of mobile tools such as smartphones or computer notebooks. They become the major devices to access information through the internet. Therefore, IoT has a role to

fill the gap between people of all ages and genders, for efficient and convenient work. It is easier to access the internet and use software.

This study aims to develop the data analysis from low-cost real time sensors to measure the areal soil moisture to monitoring the problems of growth and production by IoT. It can shorten the time and predict more accurately which can be monitored on a smartphone, so the information is quickly recognized, and the problems are in-time solved.

2. METHEOLOGY

2.1 Study Framework

The development of verifying and analyzing sensors from real-time sensors for integration of accurate agriculture consists of the following processes. The researcher studies and goes to the sample field to install the sensor of soil moisture with Wemos D1 R1 Bord. The sensor is installed in the sample field. The soil moisture values are transferred into the database phpPgAdmin. This sensor will transfer the moisture vale in the patterns of a website and an application.

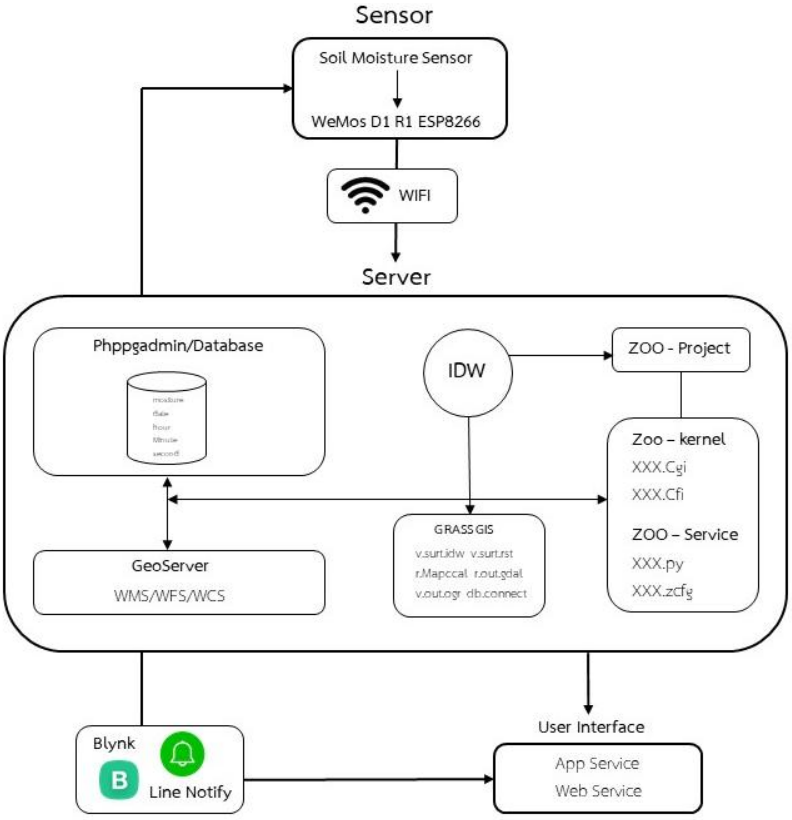

Figure 1 The designed framework

2.2 System design and development

Figure 2 manifests the overall image of the moisture measuring sensor system by Wemos D1 R1 bord. This is the system that reports important physical factors of the plants. The result is in the pattern of relative humidity in which is transferred into the database. In addition, the sensor reports in the pattern of IDW in order to display on a website and an application real time, which displays images for the overall understanding.

Figure 2 The system overview

This development of the system employs Open-Source Software and Open Hardware. These programs are applied because Open Source is the effective and cheap program, as well as Open-Source software and Hard Software tools including Arduino IDE, PostgreSQL, LINE Notify, and Blynk App. he applied Open Hardware parts for developing the sensor are Wemos D1 R1 and Capacitive Soil Moisture Sensor Module.

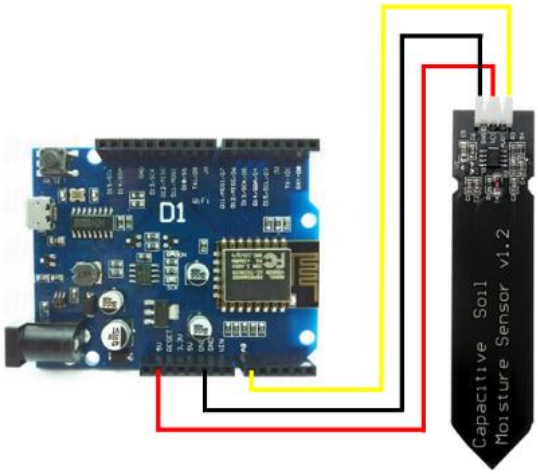

Figure 3 The soil moisture sensor with Wemos D1 board controller

According to Figure 3 that shows the microcontroller connection WeMos D1 R1, the sensor displays relative humidity of the soil is adjoined with A0 leg, Ground, and 5V cable of the microcontroller WeMos D1 R1. The LED connection is also adjoined with Ground legs and thirteenth and fifth legs of the microcontroller. It is the serial communication.

3. RESULT

The set of sensor tools is a box with the boards inside. Its roles are to measure the properties or characteristics of any things around the target object, transfer the information from measurement into the process, and analyze the changes. This set of sensors can work with battery energy charged by solar energy.

Figure 4 The system experiment in the field

For the monitoring and verifying systems via Web Service (Figure5), it shows the values of the monitoring and verified soil moisture in the form of monitors and graphs. The system monitor the actual value of each sensor which displays real-time soil moisture.

The monitoring and verifying via Smartphone using Blynk Application are about monitoring and displaying the real-time sensor values like Web Service. The Blynk service includes a part of sensor monitoring and displaying in the forms of graph and monitor (Figure 6 a,b,c). For the test of LINE Notify, it is about to notify via LINE Notification in which the data are transferred as identified by the condition. The condition is set that if the soil moisture is lower than 10%, the sensor will notify the users. The information is from the sensor station and is notified of the soil moisture as condition indicated as shown in figure 6(d).

Figure 5 Real-time soil moisture monitoring dashboard based on Web Application

(a) (b) (c) (d)

Figure 6 a-c is a Real-time soil moisture monitoring dashboard based on Blynk Application and (d) is LINE notify system

The real-time spatial data analysis for Smart Farming with IoT and Geographic Information System is about the measurement of soil relative moisture which continuously changes. According to the situation, there is an application of innovation. It is the process of WPS that is for data processing to develop the process on a website. ZOO-Project operation is employed for the Open-Source Software process. The results of the analysis manifest the density of the environment analyzed by GRASS GIS Software. The data of environment analysis by Inverse Distance Weight (IDW) presentation is shown in Figure 7.

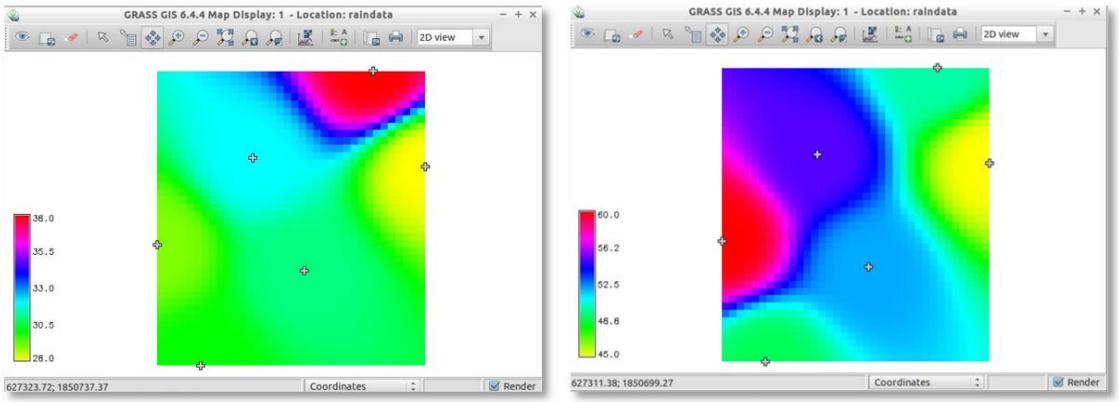

Figure the real-time spatial data analysis using ZOO-WPS

4. DISCUSSION AND CONCLUSION

This study is about the sensor system development by the application of IoT to measure the real-time soil moisture and to transfer the data to the host network. The objectives of this study are to develop the data analysis from a real-time sensor of soil moisture, to monitor the problems of growing, and to increase the production. In addition, the study improves notification and monitoring systems with Arduino IDE commands. When the sensor tool is connected to WIFI connection, the data of soil moisture are transferred to the database which are the real-time values on Web Service and Blynk App Service. The notification system will activate when the soil moisture is in LINE notify with the conditions. The operation of this soil property measurement tool records the data on the host network and calculates the Inverse Distance Weight (IDW) with ZOO - Platform, which is the Open-Source Software for spatial analysis. Moreover, the operation can manage and create WPS for cross-system processes. This set of sensor tools can actually monitor and check the soil properties real time as proposed, As a result, it is convenient, fast, and works better than general soil measurement machines so that it does not need to go to the area to collect data. This tool has higher accuracy than general measurement machines, therefore the farmers are less worried about the problems about the plants, and it increases the production efficiency.

5. REFERENCE

Choosumrong, S., Raghavan, V. and Jeefoo, P. (2016) Development of the Real-Time Environment Monitoring System for Poultry Farm Based on IoT Technology, Proceedings of the International Conference on GeoInformatics for Spatial-Infrastructure Development in Earth & Allied Sciences (GIS-IDEAS), Hanoi, Vietnam, 12-15 November 2016.