PROJECT SYNOPSIS

ON

IOT Automatic Watering System for Plants

Bachelor of Technology

COMPUTER SCIENCE & ENGINEERING

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Introduction

This is an IoT based Automatic Watering System for Plants using Arduino microcontroller. With the help of wifi, the moisture and other data can be monitored from anywhere around the world.

Plants need sufficient water to grow well. Watering plants is a work that needs to be done by farmers and plant lovers in caring for plants. Watering plants with suitable water volume is important because it has a direct impact on plants. Lack of water or excessive water content can make plants dry or rotten

Soil moisture related to water content which a factor that affects the plant growth. The process of watering plants is generally done manually regardless of the volume of water needed by plants. This research discussed about an automated prototype and a system that have the function of watering plants based on the soil moisture level. The method used is prototyping which is suitable with the research purpose. The prototype and systems built with microcontroller, soil moisture sensors, relay and solenoid valve, which integrated with the IoT platform Blynk apps and Thingspeak. The process starts from the detection of soil moisture by the sensor. If soil moisture value is detected on 30% - 35%, then the device activates the watering function by opening the valve from the solenoid valve to drain water to the pipe. When the soil moisture detected more then 35%, the device stops the watering function. ThingSpeak IoT platform, used to display moisture percentage data in graphical form. Blynk apps provide notification features to the user's smartphone when the watering device is activated or deactivated. Based on the test scenario performed, it was found that the percentage of soil moisture with an initial value of 30% - 35% increased to 68.2%, after the watering process. Each component of the device and system has been tested and functioning according to the purpose, so the system has the potential to be used in the process of watering the plants automatically.

Software and Hardware requirements

Software required:

Blynk App for demo app creation
Android Studio for final version

Hardware required:

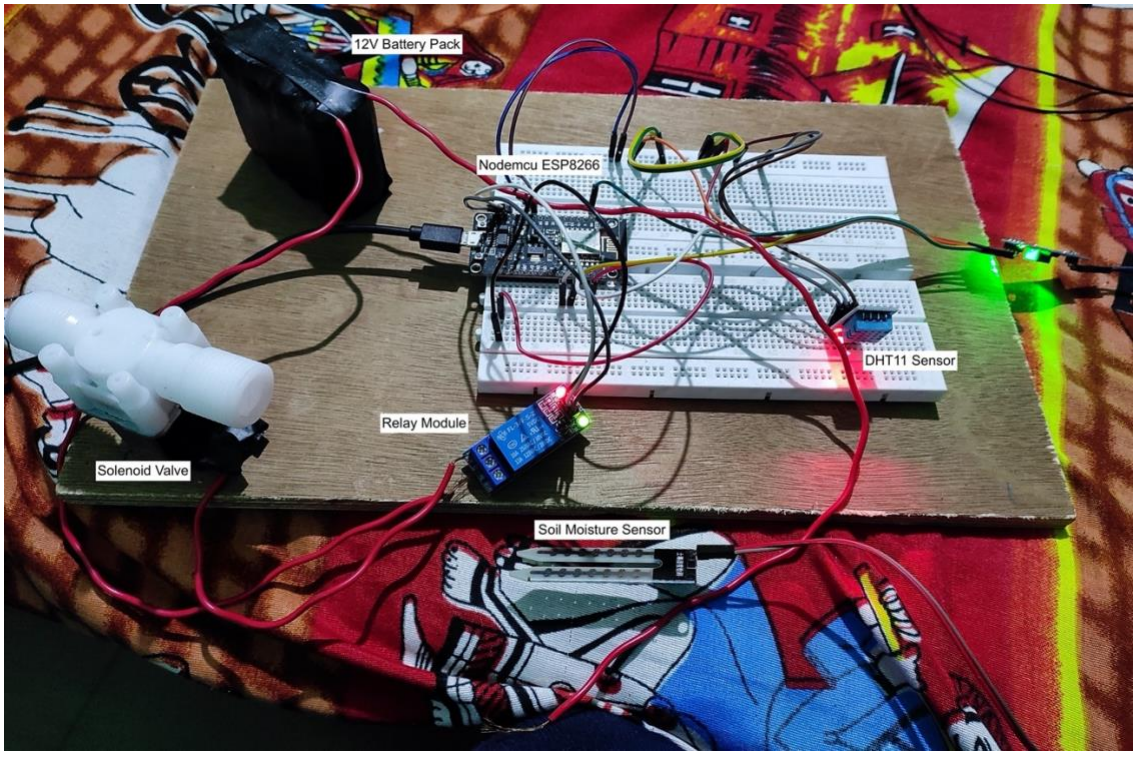
Nodemcu ESP8266 microcontroller
Soil Moisture Sensor
Relay Module
Solenoid Water Valve
Breadboard
Jumper Wires
12V Battery

Working

The automatic watering system is shown in picture down below. The automatic watering system consists of three main functions, namely the watering system, monitoring system, and notification system.

The watering system performs the watering function as shown in picture and explained as follows:

1. The soil moisture sensor is connected to the Nodemcu ESP 8266 microcontroller.
2. Soil moisture is implanted into the soil to detect water content in the soil.
3. Soil moisture sensor detect the water content from the soil and get analogue input signal to be processed in the microcontroller.
4. The Nodemcu microcontroller send the output signal to the relay.
5. The relay received output signal from the microcontroller and act as switch to the open or close the solenoid valve according to the input given to it.
6. The solenoid valve opened the valve when the relay is on and closed the valve if the relay is off. Water flows through the watering pipe when the solenoid valve opened.
7. Watering pipe is constructed on top of the plant so that the water splash to the plant and to the soil.



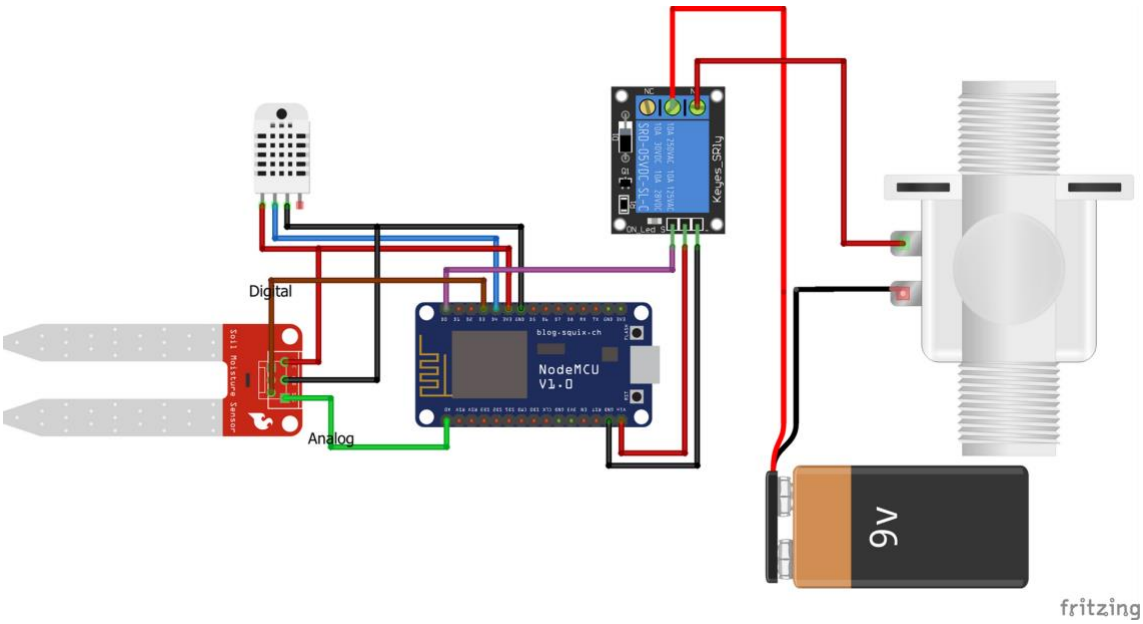
The second function is the monitoring system, which is monitoring the soil moisture using Blynk and explained as follows.

1. The signal for detecting the soil moisture was successfully received by the Nodemcu microcontroller from soil moisture sensor. Nodemcu microcontroller that has been equipped by wi-fi module and connected to the wi-fi access point, send cloud data to Blynk application.
2. Users can use the Blynk app from a smartphone to access the data.
3. After login, user can access data on the Blynk to view and monitor the soil moisture through a graphical form.

The third system is the notification system which is run when the watering device has started or finished. System send a notification to the user's smartphone. When the watering device is activated, user gets a notification on the smartphone. When the watering device has deactivated, the user gets a notification that the device is disabled. The processed is describe as follows:

1. Watering system that has been active or deactivated will then send data to Blynk App.
2. Blynk app get data from the Nodemcu microcontroller, processes the data, and send the notification to the user's smartphone.
3. Users can check the notification on Blynk App in the smartphone about the watering device whether it is activated or deactivated.

The schematic watering device is shown in figure down below. The prototype consists of a soil moisture sensor, relay module, jumper cables, solenoid valve, power cable and microcontroller Nodemcu which is connected to Blynk IoT. The figure shows an implementation of an automatic watering device. The watering pipe could be adjust according to the area of watering for plants. Figure made using Fritzing software.



App Demo

Picture down below display the Blynk application for monitoring and notification. The Blynk application display two types of notifications sent to smartphone users. The first notification is the message when the device is turn ON and perform the watering function. When the tool has finished performing the watering function, the device is turn OFF and system send the second notification to user smartphone through Blynk apps.

The yellow gauge displays the soil moisture, dark blue humidity and light blue temperature. The solenoid valve can be switched on whenever the a person feels like using a button provided in the app. User can also set a timer for valve to get automatically switch on and switch off.

Conclusion

The automatic watering system integrated with IoT platforms Blynk could perform the functions of watering the plant according to the purpose of the research. Soil moisture sensor detected the water moisture in the soil and send signal to Nodemcu microcontroller. The reading results from sensor, processed by the microcontroller to generate the watering function automatically. The system sends notification to Blynk apps, when the device activated or deactivated the watering function. The system has the monitoring feature to record the soil moisture value through sensors which display the data through graph. The system had to connected to the internet to performs the real- time monitoring and notification. When the system disconnected from the internet, monitoring and notification functions could not be proceed, but the watering device will still perform watering function.

The initial value of the soil moisture could be adjust according to the moisture needed by the plants. This can be done by reprogramming the microcontroller. For this research, we set the initial value of the soil moisture in range of 30% - 35%. The testing results of the Blynk soil moisture monitoring based on the experimental scenario, calculated the average final value of soil moisture is 68,2%. This means that, in one cycle of watering, the device could perform the process of moisturizing the soil with average increment calculated 35,8%.

For further research development, the system could be added with more soil moisture sensors or another sensor such as temperature and humidity sensor and then conduct different experimental scenarios to gain the comparison. The watering pipe could be customized according to the area of the plants on the ground. This automatic watering system has the potential to used simply for gardening or implemented the field of agriculture. Moreover we can use an android app to add more features which are currently reserved for Blynk premium users.

References

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