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IoT Based Plant Monitoring System using Node MCU

Riju Bhattacharya, Department of CSE, SSIPMT, Raipur
Shatakshi Shrivastava,Department of CSE, SSIPMT, Raipur
Apoorva Ojha, Department of CSE, SSIPMT, Raipur

Abstract – Internet of Things involves the interconnection of physical devices to the internet. The fundamental motivation behind the conception of the Internet of things (IoT) framework lies in the control, regulation and automation of physical parameters which in tandem work against the programs written for its execution to solve a particular problem. This paper aims to automate such a mechanism, which can revolutionize the way in which we handle household plants. Soil moisture, temperature, humidity, sunlight and PH are important parameters for growth in plants. The data collected by the sensors based on the above parameters is used as the information to monitor and control plant growth. Thus the proposed system uses soil moisture sensor and temperature sensor which are interfaced with the NodeMCU microcontroller that will allow us to remotely monitor the plants for the temperature it can withstand and water it when needed. The data collected by the sensors based on the above parameters is used as the information to monitor and control plant growth. The system can be controlled by its user with the help of smart phone using IoT. This paper identifies the problem of humans not being able to render the changes in shade and provide convenience in satisfying timely water requirements and tends to automate it.

Keywords-*Internet of Things(ToT), Plant monitoring, NodeMCU microcontroller, Soil moisture sensor, DHT11 temperature sensor.*

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I. INTRODUCTION

IEEE defines IoT for low complexity systems as follows: [1] "An IoT is a network that connects uniquely identifiable "Things" to the Internet. The "Things" have sensing/actuation and potential programmability capabilities. Through the exploitation of unique identification and sensing, information about the "Thing" can be collected and the state of the 'Thing' can be changed from anywhere, anytime, by anything."

The aim of implementing IOT is to remotely be aware of our "Things" through a smart system that takes control of all your devices and simple mechanisms of our day to day life, and promptly notify and update the user of the status.

In the hustle bustle of today's busy life we generally forget to take care of our plants properly which may cause degradation of their health.Even when we go on a vacation, we need to ask our neighbors to help us out in watering the plants. Thus we build a system that will allow us to remotely monitor the plants for the temperature it can withstand and water it when needed.

Plant management is not an easy task by any standard. The water and shade needs of any plant are crucial for the process of photosynthesis. These two variables combine to form a function that ultimately decides the mortality rate of the plant. This project seeks to hand the two variable controls to the user even from a remote location over the World Wide Web on a secure connection to enable them to monitor and control the growth of the plant.

II. RELATED WORKS

In [2], author proposed an automatic irrigation system which is controlled using 8051 microcontroller. Whenever there is change in temperature or humidity the sensors send an interrupt signal to the microcontroller which activates the automatic sprinkler system.

In [3],author aims at replacing traditional farm-land techniques which use manual intervention by automatic irrigation system. The system uses mobile phones which are connected through GSM technique. Whenever the sensors send signal interrupts to microcontroller it connects with the mobile phone which enables a buzzer to indicate the user to switch ON the water supply.

In [4], The plant monitoring and controlling system uses Arduino as the heart of the entire system. As soon as the change is detected in the plant's environment in terms of soil moisture, temperature and light intensity, the Arduino takes control over the devices and bring the environment back to normal range. The system uses GSM module which is interfaced with the Arduino in order to notify the user through SMS about the status of the crops.

Plant monitoring system in [5] is helpful in watering plants and monitor other growth parameters. Here, study has been conducted by dividing the field into four sectors with separate moisture sensors. The BMP180 temperature and pressure sensor measures the values in the surrounding environment and automatically turns on the heater connected through relay if the temperature is less. The system also captures the images of plants and analyze diseases using image processing. Image retrieval involves Kekre transform and variance methods. Image retrieval helps in analyzing situations like mud cracks and water logging.

Smart water sprinkler system in [6] monitors the growth of chili plants by analyzing the factors like plant height, number of leaves and flower buds. This system also uses moisture

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sensor and pH sensor is used to maintain the alkalinity in the soil. The microcontroller used is Arduino. Farmers can monitor the plant conditions and control the system through smart phone. Ethernet shield is used for connectivity.

In [7], Tomen (Tomato garden) is a plant monitoring system using IoT with the help of a Raspberry Pi controller. It continuously monitors the environmental conditions of the garden and gathers and analyze the data about the changing soil and weather conditions. Tomen solenoid water valve automatically controls the water system based on the moisture levels.

III. SYSTEM REQUIREMENTS

A. Micro controller- NodeMCU

NodeMCU is a firmware with a development board containing 16 pin and featured with WiFi capability, analog pins, digital pins, and serial communication protocols. Many Arduino boards support the connection link with the WiFi while NodeMCU has ESP8266 WiFi module embedded on its microcontroller chip.

Fig.1. NodeMCU

B. Soil Moisture Sensor

Soil moisture sensor which is inserted into the soil measures the volumetric content of the soil by allowing current to pass through it. It takes resistance value to measure the moisture and give the output between 0 to 1023. If the resistance is low then the moisture is high.

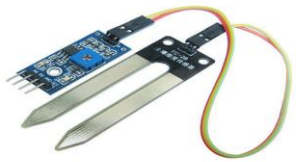

Fig.2. Soil moisture sensor

C. Temperature and Humidity Sensor

DHT11 sensor is used here, as it is most commonly used cost-effective digital humidity and temperature sensor. It employs a thermistor to measure surrounding temperature and sends a digital signal to the data pin.

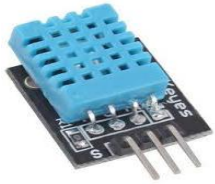

Fig.4. DHT11 temperature sensor

D. Blynk Android Application

Blynk is a Platform with iOS and Android apps to control Arduino, NodeMCU and the likes over the Internet. It's a digital dashboard which enables us to assemble a graphical interface for your project by simply dragging and dropping widgets.

In this project we use a virtual LCD widget for displaying moisture level and temperature of the surroundings. Button widget is used in to switch ON and OFF the water supply through this application.

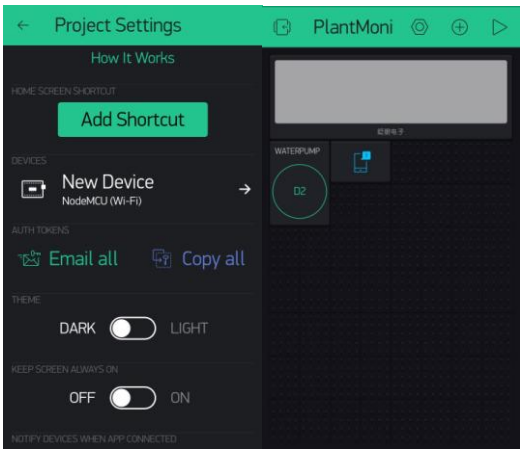

Fig.3. Blynk application

IV. PROPOSED METHODOLOGY

The proposed Plant Monitoring System uses NodeMCU as microcontroller. NodeMCU comes with the inbuilt ESP8266 WiFimodule which connects our system to blynk app using WiFi. The program which controls the functioning of the whole system is fed into the microcontroller using Arduino IDE which is an environment which integrates code with the hardware. Soil moisture sensor continuously detects the level of moisture in the soil and displays it on the Virtual LCD widget on the Blynk app. If the water content in the soil is less than what is required by the plant, a notification is sent to the user's smartphone and he/she can switch ON the button widget in Blynkapp which will turn ON the water supply. Real time values from the DHT11 temperature sensor are also displayed on the virtual LCD. Excessive heat from the sun can be harmful for plants to prevent them from dying we introduced a green shade which will automatically be drawn over the plant with the help of two DC motors which rotate clockwise and anti-clockwise to help movement of the shade. Temperature more than 30 ºC can cause shriveling of plant.

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When temperature increases this limit the motor rotates and cause the shade to move automatically. The user is notified about each and every step through the notification feature of the Blynkapp. Hence, this system monitors and controls the plant's requirements remotely.

Fig.4 Model

V. RESULT

Using Internet of Things we can establish communication between various household devices to bring out automation. Automation in routine household chores can save a lot of time and also organize the lifestyle of an individual. Point of this project was to layout a circuit that comprise of sensors and utilizing idea of Internet of things that monitors and analyses the information provided by the sensors and notifies the user regarding the changes in the plant's conditions.

This plant monitoring system is a low cost system whose basic use is for the household purposes. Alongside it is kind of an interesting concept as the plant itself can call for water and protection whenever it needs it.

The IOT system was thus developed using two major problems in context – to monitor and control the shade which inversely alters the amount of sunlight received by the plant. The catch of finding the correct shade time interval was crucial as too little sunlight would result in starvation due to lack of food preparation and too much would cause irreparable damage to the biological structure of it leading to eventual mortality.

VI. CONCLUSION

This project has been successfully implemented, tested and illustrated in the form of small model using a plant pot.

Thus this project can revolutionise the plant monitoring technique by the effective automation methods.

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