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Smart Gardan with IOT base Plant Monitoring System

Ashwin Kumar Yadav
Department of Electrical Engineering Rajkiya Engineering college Ambedkarnagar,UP, India
ashwinyadav55111@gmail.com

Abhishek Pandey
Department of Electrical EngineeringRajkiya Engineering college Ambedkarnagar,UP, India

Lalit Gond
Department of Electrical Engineering Rajkiya Engineering college Ambedkarnagar, UP, India Ravindra Kumar*Assistant professor*

Dr. S.P Singh
Associate professor Department of Electrical Engineering Rajkiya Engineering college Ambedkarnagar,UP, India

Dr. A.K Mishra
Director Rajkiya Engineering College,Ambedkarnagar,UP,India

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Abstract:
Basic guidelines for the preparation of a technical work for an Test Engineering and Management Journal Publication are presented. This document is itself an example of the desired layout (inclusive of this abstract) and can be used as a template. It contains information regarding desktop publishing format, type sizes, and typefaces. Style rules are provided that explains how to handle equations, units, figures, tables, abbreviations, and acronyms. Sections are also devoted to the preparation of acknowledgments, references, and authors' biographies. The abstract is limited to 150–200 words and cannot contain equations, figures, tables, or references. It should concisely state what was done, how it was done, principal results, and their significance.

Keywords:*At least 5-6 keywords separated by comma.*

I. Introduction

In today's busy world, we forget to take care of our home like nourishing and watering plants that makes our home clean and soothing. With the growing pace of time the technology had brought in a great revolution in the world and made our daily life works a lot easier. Virtual reality has taken over the normal life. We are busier on social networking site like Facebook and WhatsApp rather than in our real life. So what if we give the updates of their garden on their smartphone.Therefore, we sought to develop a device which can monitor our garden and then communicate with the user. Kevin Ashton in 1999 coined the word Internet of Things. IoT brought the way to establish the communication between the humans and physical objects. So, our system is equipped with soil moisture and light intensity sensor which checks the moisture content of the soil and sunlight intensity on the plants on the regular time basis and the data is collected by the Bolt IoT platform. That data is analyzed and communicated to the users.

II. Related Works

A. Smart Garden

Table I shows the comparison[1] of related works in Smart Garden projects, which are Smart Watering System for Gardens using Wireless Sensor Networks

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[2], Automated Plant Watering System [3] and IoT-based Green House System with Splunk Data Analysis [4].

TABLE 1: Comparison of Smart Garden Project.

List of smart-garden projects	Specifications
Smart Watering System for Garden using Wireless Sensor Networks	• Operating System: TinyOS • Soil Moisturizer Sensor Module • Wireless Sensor • Use Solenoid Valve as Actuator for flowing the water to the plant
Automated Plant Watering System	• Arduino System • Moisture Sensor • Water Pump • Relay for activate the water pump using Altemate Current (AC)
IoT-based Green House System with Splunk Data Analysis	• Raspberry Pi System • Display the data from sensor to the "Splunk" for Analysis purpose • Multi-Module Sensor

III. Method And Material

The proposed architecture of the IoT device is shown in Fig.1. Here the role of Bolt IoT Wi-Fi module is to gather and send it to cloud. Further the data are sent to Integromat logic. In the Integromat logic when the scenario is run, Bolt IoT App send a digital read and analog read request to the Bolt to get moisture content and light intensity data. After that three set variable tools are required to get the current time and to set the operation time of the scenario. It checks the moisture present in the soil and the availability of sunlight falling for the plant at that place in time to time and is compared to the set limiting value.After the data is processed and verified by a logic created using Integromat (cloud-based logic designing), accordingly an SMS is sent to our smartphone through Twilio (cloud communication platform) and then the user will take required action according to the data.

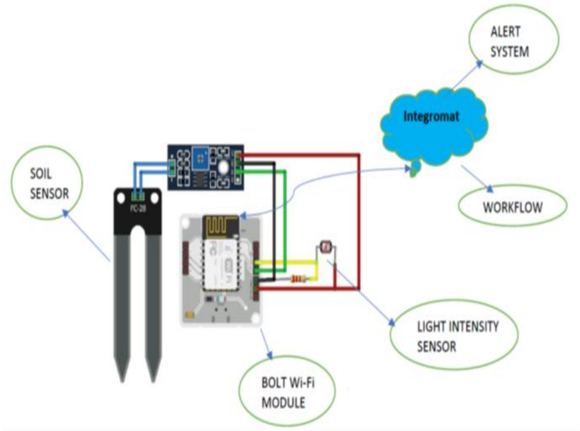

Fig.1. Architecture of Soil Monitoring System

A. BOLT WiFi module:

Fig.2 shows the BOLT Wi-Fi module which is an open source, cloud based IoT module with on board ESP8266-12S chips [6]. It is can easily connected to our smartphones with Bolt IoT apps. This board is powered through a USB cable with 5V DC supply.This moduleis equipped with GPIO(General purpose Input/Output)[1] facility. Based on ESP8266-12s there are multiple variety of IoT modules available. But Bolt IoT development module has the additional facility of Bolt cloud that can be accessed through Bolt app on our smartphone which is further connected to the module via Wi-Fi internet. The following TABLE II and III gives the general specification and pin specifications [7].

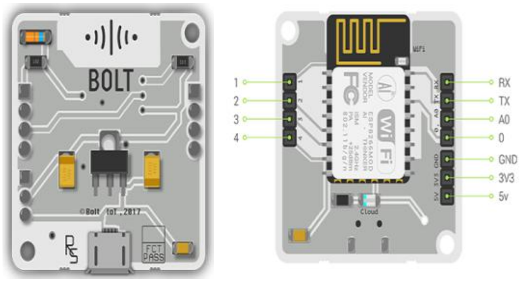

Fig.2. Bolt Wi-Fi module

TABLE II: Showing general specification.

Parameter	Details
Connectivity and Processing Module	ESP8266 with custom firmware
MCU	32-bit RISC CPU: TensilicaXtensa LX106
Operating Voltage	5V
CPU Clock Frequency	80 MHz
Wi-Fi	802.11 b/g/n

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UART	8-N-1 3.3V TTL UART [using TX, RX, GND pins]

B. Soil Moisture Sensor

For measuring the volumetric content of the soil this module is used. Water is one of the most important ingredients for the survival of the plants along with the sunlight. The moisture content of the soil decreases due to the evaporation and absorption by the roots of the plant. Thus, soil moisture sensor determines the real time moisture content of the flower pot or the fields. LM393 comparator is the main component of the sensor which has uses potentiometer for adjusting the soil dry/wet detection[5] limiting value. These soil moisture sensors can be classified into two types: Frequency domain sensor and neutron moisture gauze[1]. Frequency domain sensor consists of an oscillating circuit whose working principle is that it measures the soil dielectric constant which increases as the soil moisture increases and vice versa. And thus, it is estimated how much amount of water the soil is holding. On the other hand, is neutron moisture gauze, which works on the principle that the decaying radioactive sources emits the fast-moving neutrons which will gets collided with the protons and thus got slowed down. The measurement of the number of slow-moving neutrons will give the percentage of moisture in the soil.

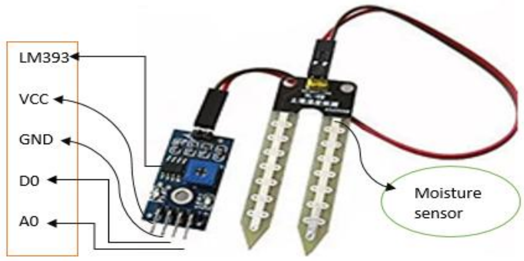

Fig.3. Soil moisture sensor

TABLE III PIN DEFINITION

PIN	DEFINITION
VCC	POWER SUPPLY
GND	GROUND
D0	DIGITAL OUTPUT
A0	ANALOG OUTPUT

C. Light Intensity Sensor

Light intensity sensor is a device used to measure the intensity of the light available showing in fig.5. LDR (Light Dependent Resister) is the component used in the sensor. It is basically a photocell which works on the principle of photoconductivity means the resistance falls as the increase in light intensity.

Typically, it has the following resistances:

Daylight= 5000Ω

Dark= 20000000Ω

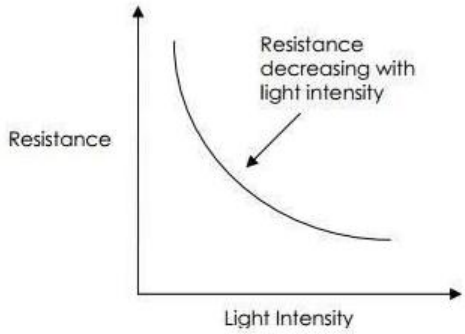

Fig.4. LDR resistance vs light intensity graph.

Fig.5. LDR

D. Twilio

Twilio is a cloud-based communication platform and a service company based in San Francisco, California. Twilio gives the facility to software developers to design programs for receiving phone calls or send and receive text messages through the web service APIs [8].

E. Integromat

Integromat links together our required apps/services/cloud by their corresponding sensors/modules to create a scenario for the gathering of data through a logic. Sohere wehave to design a logic scenario that will run and collect the data when the request is called and Integromat will analyze the data and the required task will be executed.To connect with the Integromat we have to take following four steps which are as follows:

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- Firstly, make an account on Integromat on the website[9].
- Secondly, click on the 'Create a new scenario' button located on the top right corner in dashboard.
- Thirdly, choose BoltIoT and Twilio in the services option.
- Fourthly, design the logic flow as shown in the fig.6.

Fig.6. Creating workflow on Integromat

• Now we have to start the BoltIoT service and for that enter the credentials. i.e. Bolt device ID and API key and SSID, authentication token number, sender's number for the Twilio service as shown in the fig.7.

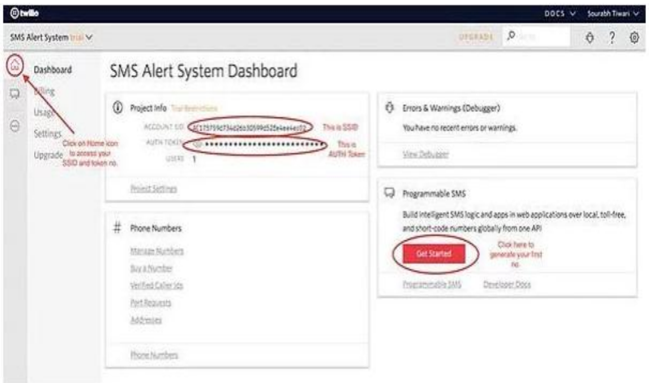

Fig.7. Connecting Twilio service to Bolt device ID

Fig.8. Entering API credentials on bolt app.

IV. RESULT AND DISCUSSION

This complete system of sensors, Bolt module and software have been done to monitor the garden. But for the testing purpose we setup the whole system in a small scale by in flower pot. We have created a workflow in Integromat platform to setup an alert via SMS through Twilio. As soon as the light availability or the moisture content will get below the limiting value, an alert system will be activated and the SMS is sent to the user to take the required action as shown in the fig.9.

Fig.9. Alert message to water the plant.

A. Soil Moisturize Module Sensor

The sensor output value are in percentages. During the testing, the dryness limit of the soil is kept at 35%. Therefore, when the moisture of the soil willless than the threshold value 35%, then output of the sensor is LOW otherwise it is HIGH. This digital data is read from the pin 0 of the BoltIoT module.In the Integromat logic when the scenario is run, BoltIoT App send a digital read and analog read request to the Bolt to get moisture content data.If system finds the condition satisfied then it sends an SMS to the user alerting him about the plant health.

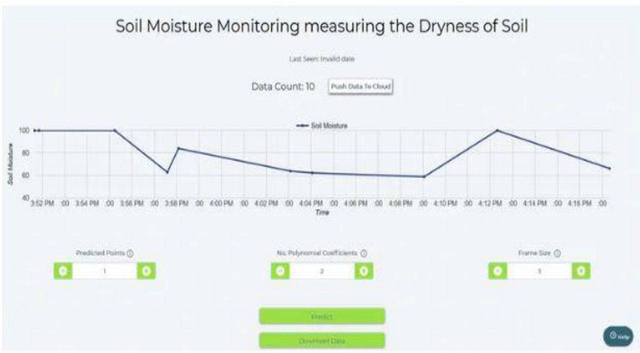

Fig.10. Moisture vs Time graph

B. Light Intensity Module Sensor

This module contains LDR whose resistance increases as the light intensity decreases. LDR measures the amount of sunlight available for the plants. At the regular interval of time when the Integromat logic runs it requests the data from the bolt cloud. LDR senses the data which is taken as input to the Bolt unit after then it is sent to cloud from where it is used by the Integromat logic.In case of LDR analog data is read from the A0 pin of the Bolt module. But while using this component in the device first the system will check whether it is daytime or not and should it run the rest of workflow logic or not on the Integromat. If it's daytime then it checks for an error (if errors are not checked the scenario will be stopped by Integromat). Fig.11 shows the real time light intensity on Bolt app.

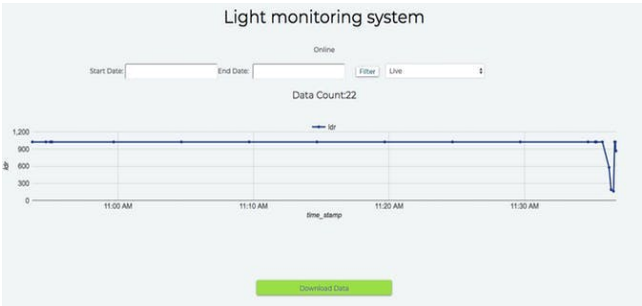

Fig.11. Light intensity vs Time graph

V. CONCLUSION

The paper on the Smart garden with IoT based plant monitoring system is presented and in this we successfully designed the system and tested on the small scale in the flower pot. The designed project can analyze the required data in the real time and then send result to the user in their smartphone apps to take required action. This system is very much user friendly and easy to use. There are almost no maintenances in the proposed system. The user can also check the real time moisture and sunlight availability on the Bolt IoT app in their smartphone along with the alerts. This device contains many sensors such as light sensor and soil moisture sensor which runs long without getting damage and is very cheap. The main processing unit on this device is Bolt IoT Wi-Fi module. Therefore, the designed low cost IoT device that can monitor our plants and gardens.

VI. REFERENCES

[1] R. K. Kodali and A. Sahu, "An IoT based soil moisture monitoring on Losant platform," 2016 2nd International Conference on Contemporary Computing and Informatics (IC3I), Noida, 2016, pp. 764-768.doi: 10.1109/IC3I.2016.7918063

[2] H. Abbas, G. M. Ahmed, E. A. Ahmed, R. Ahmed, A. Azeem, and A. Seoud, “Smart Watering System for Gardens using Wireless Sensor Networks,” 2014.

[3] D. Divani and P. Patil, “Automated Plant Watering System,” pp. 180–182, 2016.

[4] Y. Chen, “IoT-based Green House System with Splunk Data Analysis,” IEEE Conf. Pap., no. iCAST, pp. 260–263, 2017.

[5] bin Sadli, M. D. D. (2019, April). An IoT-based Smart Garden with Weather Station System. In 2019 IEEE 9th Symposium on Computer Applications & Industrial Electronics (ISCAIE) (pp. 38-43). IEEE.

[6] Aldair, A. A., Rashid, A. T., & Mokayef, M. (2018, November). Design and Implementation of Intelligent Control System for Egg Incubator Based on IoT Technology. In 2018 4th International Conference on Electrical, Electronics and System Engineering (ICEESE) (pp. 49-54). IEEE.

[7] www.boltiot.com

[8] www.twilio.com

[9] www.itegromat.com

[10] Vani, P. D., & Rao, K. R. (2016). Measurement and monitoring of soil moisture using cloud IoT and android system. Indian Journal of Science and Technology, 9(31), 1-8.

[11] Srilikhitha, I., Saikumar, M. M., Rajan, N., Neha, M. L., & Ganesan, M. (2017, July). Automatic irrigation system using soil moisture sensor and temperature sensor with microcontroller AT89S52. In 2017 International Conference on Signal Processing and Communication (ICSPC) (pp. 186-190). IEEE.