

An IoT Based Smart Garden With Weather Station System

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Abstract- *Internet of Things helps devices to connect to the internet and will be able to communicate with each other. It also helps in enabling the devices to collect and will be able to exchange the data with consumer. Usually many people forget to water their plants which results in plants dying. Hence in this study, the device consists with water pump in which it can be monitored and controlled by a smart phone. For better monitoring of the plants this device consists of four main sensors, DHT11 temperature, humidity sensor, soil moisture sensor and light intensity sensor. There are two actuators that are present that is water pump and LED light that can be used remotely or by using the buttons in the device. The main purpose of the LED is to replicate the sunlight which results in plants growing faster. In this IoT based smart garden with weather station system is capable of recording the data and send the acquired results to the user using the Smartphone application called as Blynk apps*

I. INTRODUCTION

As we know that people like stay connected to the internet these days while doing their chores such as laundry, Cooking, watching television and many others. There are lot useful technologies has been evolved in this field and helps in agriculture, and sprays the water for the plants when necessary, and helps in the growth of the plants, and also pick the vegetables based on its texture and many other factors. Internet of Things helps devices to connect to the internet and will be able to communicate with each other. It also helps in enabling the devices to collect and will be able to exchange the data with consumer. Usually many people forget to water their plants which results in plants dying. Hence in this study, the device consists with water pump in which it can be monitored and controlled by a smart phone. For better monitoring of the plants this device consists of four main sensors, DHT11 temperature, humidity sensor, soil moisture sensor and light intensity sensor. There are two actuators that are present that is water pump and LED light that can be used remotely or by using the buttons in the device. The main purpose of the LED is to replicate the sunlight which results in plants growing faster. In this IoT based smart garden with weather station system is capable of recording the data and

send the acquired results to the user using the Smartphone application called as Blynk apps which will help the gardener to get real time updates to the Smartphone that has been equipped with the device.

II. RELATED WORKS

An IoT based smart garden helps in gardening and it is mainly used for monitoring and providing the necessary resources required for the plants to grow faster. In this DHT11 sensor have been used to check the temperature of the plant, and also gives the humidity values in degree Celsius. Soil moisture sensor gives the water content in the soil and act accordingly. If the water is too dry the water pump that is connected through relay will turn on.

As compared to the paper Smart Watering System for Gardens using Wireless Sensor Networks [1] its main application is to detect the water content that is present in the soil so that it can use the water efficiently. [2] IoT-based Green House System with Splunk Data Analysis is used for the green house monitoring system which is only applicable for medium and small sized green house installations with real time data analysis. It is equipped with raspberry pi system and all the data collected will be sent to the “Rethinkdb”. In this paper the weather station system tells us the temperature and humidity values and it will be notified to the gardener. Efficient Design of a Low Cost Portable Weather Station [4], Development of a Low Cost Weather Station using Free Hardware and Software [5] and Design of a Remote Weather Factors Monitoring System [6]. These are the three projects that are related to the project smart garden with weather station system. There are many sensors that are present for the air humidity and temperature that can be applied in the IoT projects. In this smart garden with weather station system consists a specific sensor called as DHT11 which measures the air humidity and temperature in the research areas that it has been placed. Automatic Plant Monitoring and Controlling System over GSM using sensors [7]. Hardware and software architecture of multi mems sensor inertial module [8]. Addition to this there is a light intensity sensor or light sensor which is a device that can measure the intensity of the

brightness of the light. LDR is connected to the PIR sensor which makes the smart lightning system, which is capable of turning on the lightning system depending on the darkness in the room or by the movement of the human. A Smart Lighting System using Wireless Sensor-Actuator Network[9]. Then there is a soil moisture sensor which is capable of measuring the volumetric of the water that is present in the soil. Automatic irrigation system using soil moisture sensor and temperature sensor with microcontroller AT89S52[10]. In this project the soil moisture sensor has been used to get the information of the volume of the water that is present inside the soil and those values will be compared with the threshold values. If the value that is compared is less than the threshold values then water pump will be turned on and according to that the farmer will be notified that the water need to be replenished .

III. TECHNICAL DETAILS

Arduino developed an open source microcontroller called as arduino uno based on the microchip called as ATmega328p microcontroller. The board contains 14 pins , 6 analog pins, and programmable with arduino IDE. The arduino has number of ways to communicate with the computer. In this the microchip ATmega328p helps with the communication and provides an UART TTL that has 5V serial communication that is available on the 0(RX) 1(TX). Here the arduino software contains serial monitor which helps in sending and receiving the textual data from the board. Instead of resetting the button physically before an upload, arduino uno helps in resetting by software running on a connected computer.

IV. METHODOLOGIES

In the project smart garden with weather station system contains a microcontroller called NodeMCU which helps in collecting the data from the sensors and sending them to an application called as Blynk. Second components comes the acutators that is LED lights which is used for the artificial light energy in which it helps the plants to do photosynthesis process. Water pump is used if the plants go dry. The most important components in this project is the sensors one of them is soil moisture sensor which helps in measuring the moisture of the soil, DHT11 to measure the temperature and humidity, LDR is used to detect the for the plants and helps in the photosynthesis process.

1) DHT11 sensor test

DHT11 sensor has been used to check the tempearature and humidity around the sensor. The user will be

able to make sure to that the plant will grow under certain temperature values by collecting data from device. Most of the plants will be able to tolerate the values that will be more than 0 degree Celsius. And the humidity for the plant ranges from 40 percentage to 70 percentage. If the humidity of the plants is less than 40 percentage than plants will be dry and it indicates that the plants need water in the soil. If the humidity is more than 80 percentage then the amount of water is too much for the plant to hold and later it will be condensed and dew will be formed. In here the online forecast will be used as a reference and will be compared which will give us the perfect values. Depending on these values shows that the device is giving a correct values and is working. Every value will fluctuate and might give slightly different values from the direct sunlight.

2) Light module sensor test

Light module sensor helps in measuring the intensity of the light. For LDR the resistance value be lower if the intensity of the light is greater. Depending on the creator on the value that is best for detecting the minimum intensity of the light the potentiometer that has sensor will be adjusted, so that it will be able to trigger the artificial light sources. By the author of [11] states that “plants look green, so they are able to reflect green light, so it may not be used for photosynthesis or any other interesting things that the plants do, so by using blue or red lights we might be able to keep plants happy and use less energy because we're not producing green light which would just get reflected.”

3) Soil moisture sensor and water pump

Soil moisture sensor is used to measure the moisture content or the water content around the soil. The unit of this sensor is in percentage. As some soil gets moisture and the value gets higher some sensor needs to do the reverse reading. The minimum dryness the soil can hold is less than 30 percentage, which means that the actuator will be turned on if the soil moisture goes less than 30 percentage. The actuator that is present in this is water pump. If the soil moisture goes dry it triggers the actuators and water pump will be turned on and there should be a delay of 10 seconds before the program to loop back. As soil moisture sensor takes some time to get adjust with the new moisture in the soil this step is necessary.

4) Water level detector sensor

This sensor helps in measuring the water level in the pump or any other areas that this sensor has been placed. In this the resistance is inversely proportional to the height of the water, that means if the sensor is immersed in more water then the conductivity will much better and will result in lower

resistance. And if the sensor is immersed in less water then the conductivity will be low and results in higher resistance.

5) IoT based smart garden with weather station system

In this NodeMCU is used to implement the connection between the device and the mobile apps. But it is quite similar when compared with the arduino uno. However nodeMCU has a WiFi module that is ESP8266 on its board, as it will be used to connect between the mobile apps and sensor. There is an application called as blynk app in which all the collected data from the sensor and will be sent to it and it is installed in both android and IOS and can be downloaded anywhere. In this project the values of the temperature and humidity, soil moisture and light intensity module sensor will be sent to the application, here we are using android smart phones. And those values will be same compared with the sensor values. The Fig 1 shows the overall values of all the sensors and those values will be showed in the blynk application.



Fig. 1 All sensor data reading in blynk app

This IoT based smart garden with weather station system is very useful for the gardener. And the main goal of this project is to give a real time notification of the temperature, humidity, soil moisture and light intensity module using the sensors. The below fig 2 shows the overall project outcome of the smart garden with weather station system



Fig. 2 smart garden

As you as in the fig 2 the device has been equipped with DHT11 sensor which will tell us the temperature and humidity sensor, soil moisture sensor has been set in the soil to get the values of the moisture content in the soil, and it is even equipped with a water pump will has been immersed in the water, so if the soil moisture goes dry the pump will be turned on with a delay of 10 seconds. And there is a water level detector will tells us the level of the water that is present in the pump. And all these values will be sent to the user using a mobile application called as Blynk app.

V. CONCLUSION

At last this paper shows the implementation of the internet of things and have built the project smart garden. Since many people nowadays won't be able look after their garden on daily basis this project helps them in maintaining the plants by checking their temperature and humidity, moisture content in the soil and an artificial light called light intensity sensor. And the user will be able to get the real time values on their mobile application called bylnk app. Hence they will be able to control their garden without having being physically present there.

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