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Plant Monitoring System for Greenhouse Management

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Abstract: ***This system is intended to monitor the extinct plants. Generally, these kinds of system will be deployed in the garden of our home, but we made them suitable for the greenhouse in monitoring the individual plant. This system has light, temperature, humidity and moisture sensors are available, our work to monitor the plant will be much easier. This entire thing will be ease by the concept of Cloud and IoT. We need a microcontroller that connects the cloud via the internet. Due to this purpose, we discovered the Bolt IoT module integrated with its cloud. Since this module is having only a single analog pin to read the data, we interfaced with the Arduino UNO with the Bolt by UART protocol. By connecting the required sensors with the analog pins of the Arduino board, we collected the data and pushed them to the cloud to represent the required data in a graphical form.***

Keywords: Temperature, Humidity, Moisture, Arduino, Bolt.

I. INTRODUCTION

We used the various sensors for this system such as Light Intensity sensor, Temperature sensor, Humidity Sensor, Moisture Sensor for readings. Bolt is an IoT support module that is powered by ESP8266. It supports 2.4 GHz Wi-Fi band and Arduino Uno is powered by the ATmega328P processor. We chosen these boards since both of them have the feature for the serial data communication. This made possible by implementing the UART(Universal Asynchronous Receiver/Transmitter) mechanism. The interfacing between both of the boards was done by using the hardware serial interfacing technique. This interfacing requires the appropriate interfacing code uploaded to the Arduino Uno. As we mentioned above, The sensors were get connected and the data collection is done in the following manner. We connected the Light sensor to the A0 pin of Arduino Uno which we used were LDR(Light Dependent Resistor), It measures the light intensity level which helps to maintain the light lumen level. Since it is the first analog pin that gets connected, It is data was read by the Bolt firstly by the UART transfer mechanism [1].

Then we connected the Temperature sensor to the A1 pin of Arduino Uno which we used were LM35, It helps to keep us maintain the exact temperature levels for the specified plants. This particular sensor is having a withstand capacity of about -55◦C to 150◦C. Under this threshold temperature, it works fine. Since it is connected to the A1 pin, It's data was read by Bolt secondly [2].

Later we connected the moisture sensor to the A2 pin of Arduino Uno. Here we used the Capacitive based probe sensor to measure the values. We used it to overcome the drawback of the resistive sensor such as corrosion, inaccuracy. This help to maintain the moisture level in the soil accurately since we connected to the A2 pin, It is data was sent as the third one to the Bolt module and block diagram shown in the Fig 1 [3].

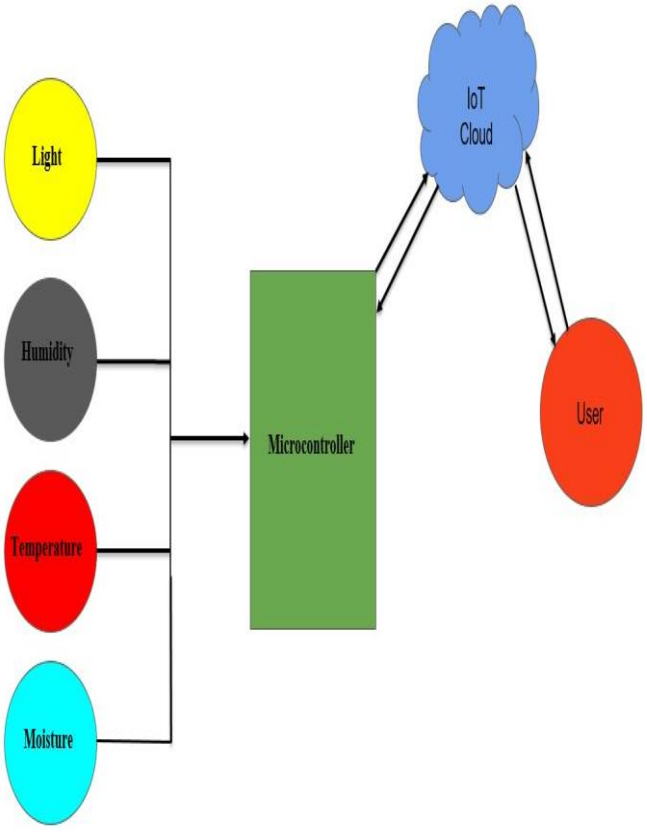

Fig. 1. Basic Block Diagram of the system

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II. MATERIALS AND METHODS

Regarding the Humidity sensor, we connected them to the A3 pin of the Arduino Uno. Here we used the DHT11 sensor to measure the humidity level in the air. It also includes the inbuilt temperature sensor in the surroundings. But we used the dedicated sensor for temperature monitoring. Since it is connected to the A3 pin, The data read were fourthly by the Bolt module from the Arduino [4].

Each of the sensors we used was decided in a manner that adapts the low power management. The following are the operating voltage of each sensor. Here we power up the Bolt by 5v. Then the Arduino Uno was interfaced with the Bolt by connecting the 5v and GND pins from the Bolt to the Arduino Uno. Since we have chosen the UART protocol for communicating the data to the Bolt module from the Arduino. We connected the Tx pin of Arduino with the Rx pin of the Bolt module. Then, vice versa we connected the Rx pin of the Uno board to the Tx pin of the Bolt module. These connections were done to make feasible the communication between both of the boards. Due to this, the data read will be possible from the Uno board [5].

In the Bolt Cloud after receiving the data, we configured it to simulate the data as a line graph. After the representation, additionally, we introduced the alert system to intimate users when it reaches a certain threshold for a particular aspect. The alert system can alert us by sending us the push notifications via dedicated bolt platform application as well as SMS to the individuals and Figure 2 & Figure 3 shows the responsibilities of the process [6].

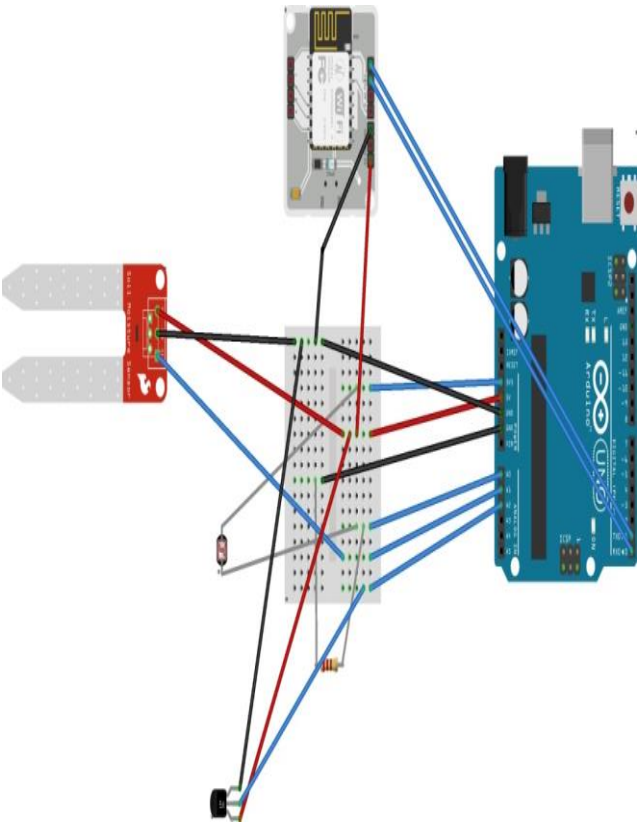

Fig. 2. Connection Diagram of the system

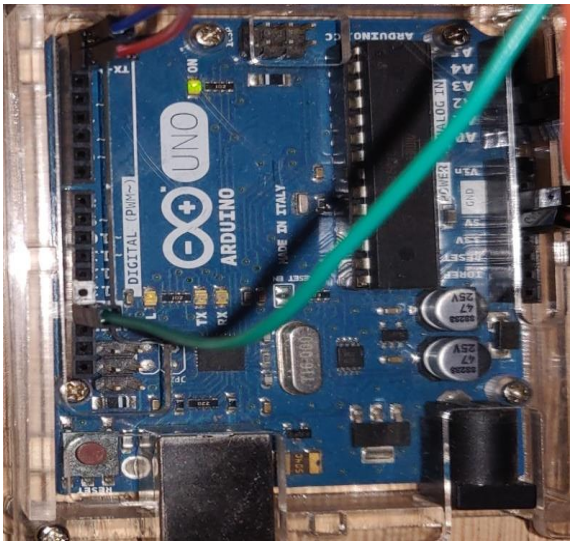

Fig. 3. Physical set of the system

This system helps us to keep track of our plants indigenously. This makes us monitor the plants at extinct in a hassle-free manner. Due to the application of the cloud manipulation and IoT, retrieval of the data and manipulating it for representing the collected data will become easier for us to keep track of it. These entire things were done real-time and updation will be done instantly due to the IoT cloud implementation. So, It helps monitor the plant in a real-time manner.

III. IMPLEMENTATION

This system mainly used to concentrate the light, temperature, humidity and moisture if any variation occur this system will alert the user through graph as well as SMS and in the Figure 4 & Figure 5 shows the variation in the graph according to the variation of graph.

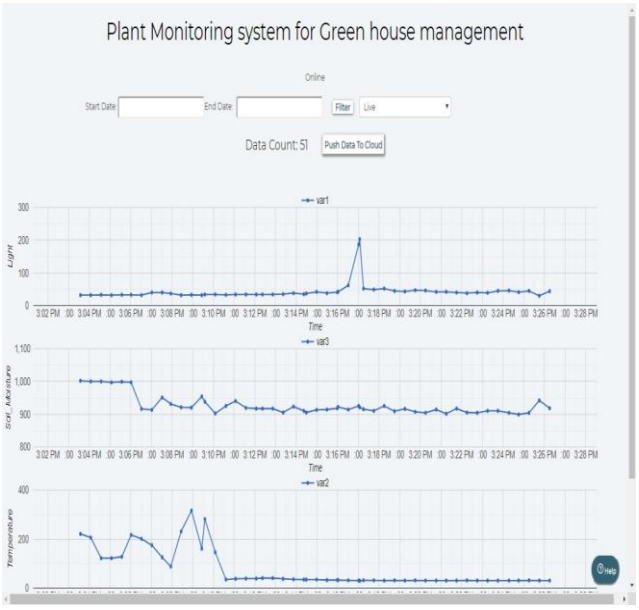

Fig. 4. Normal Graph

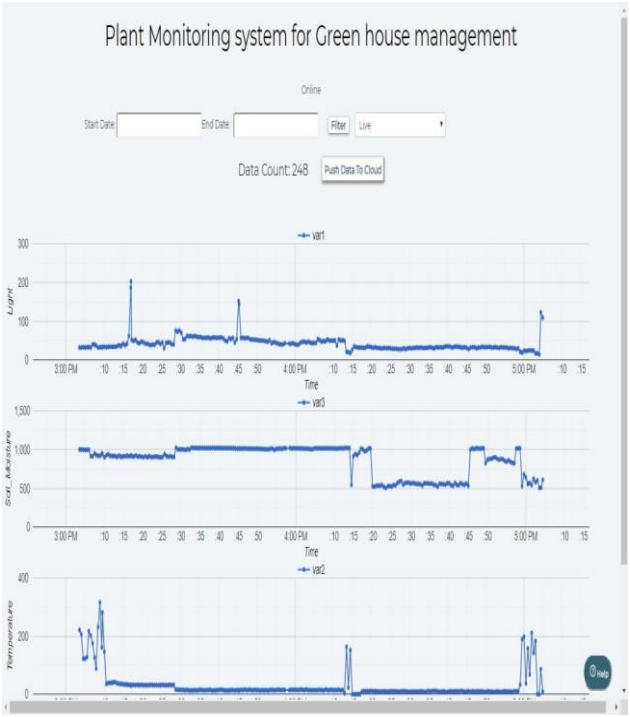

Fig. 5. Variation in Graph

IV. CONCLUSION

This system helps the e-agriculture system in future from the implementation as well in material and methods clearly explained about the sensors and work flow of the system even in implementation part also the variation among the graph is also shown. So, this is suitable for the agriculture sector leads to one green revolution in upcoming years.

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