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Monitoring and Controlling of Environmental Parameters Using Raspberry Pi

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ABSTRACT: Agricultural has been one of the essential occupations of man subsequent to right on time developments and even today manual interventions in cultivating are certain. Polyhouse is a methodology used to grow plant under controlled environment for increasing yield and quality of the crops. The development and growth of crop depends on internal environment of polyhouse such as temperature and humidity. The objective of this system is to control or maintain the atmosphere of the polyhouse by acting upon live sensor readings and be able to display the status of the system to the user. This project designs, prototypes, and evaluates an environmental monitoring and controlling system using Raspberry pi.

KEYWORDS: Agriculture, polyhouse, temperature, humidity, Raspberry pi.

I. INTRODUCTION

India mainly depends on the agriculture, hence there is need to improve the agricultural techniques due to the large production demands and the diversity, quality, and market presentation requirements in agro sector adopting the new technologies. To increase the crop production, there is need to adopt polyhouse as well as the greenhouse techniques [1, 2]. India is the second largest fruit producer next to China near about 8% and ranks second in the world vegetable production [7]. Conventional method of agriculture requires time, human effort and requires continuous monitoring as well as unpredictable weather conditions also affects the plants easily also plants are affected by pest and diseases. For the good result technology and agriculture are integrated together. Polyhouse is one of the solutions for the crops; it is built by using bamboos or iron pipes which are covered with ultra violet sheet of certain thickness, depending on the crop variety. Polyhouse makes production of the crops and plants faster. Crop or plant mainly depends on the temperature, humidity and soil moisture etc. [3]. This system concentrates and monitors these parameters by using embedded system. Monitoring of various parameter is carried out like temperature, humidity and soil moisture. The Web-Based Climatic condition monitoring system which can be accessed from anywhere and at anytime using the internet facility is build. Web-Based climatic condition monitoring is one type of recorder that monitors a temperature, humidity and moisture in a polyhouse or in a greenhouse room and stores the data into a database and display the current parameters on the website through a web server. The system will continuously monitor the temperature, humidity and soil moisture parameters of the environment and the data can be monitored at anytime and anywhere from the internet.

II. METHODOLOGY

This proposed system is used to control the growth system, shown in figure 1. This embedded system contains two types of sensor, arduino, raspberry pi, GSM module, Wi-Fi module and output controlling devices.

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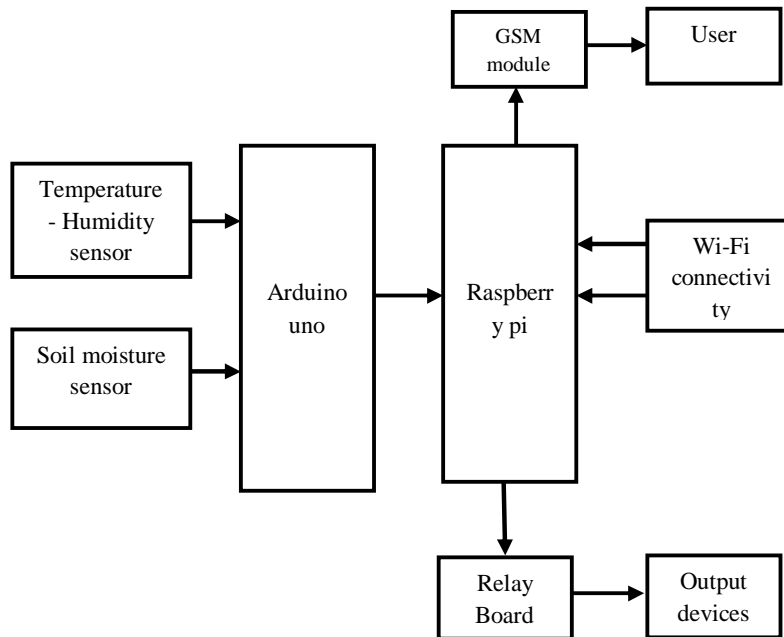


Figure 1 block diagram of the system.

The analog output from the sensor is given to the arduino which converts it into digital signal which is given as an input to the raspberry pi which acts as a server where the data is stored. All the data is pushed into the cloud, to monitor through the application and control. A windows application is built to view all the data in a PC or on mobile. Here Internet connectivity is provided using wi-fi module. When the input signal from the sensors crosses the set threshold value the controlling devices get actuated to balance the environmental parameters also a message is send to the registered number. The controlling devices used here are fan to control the humidity and temperature and motor to pump out the water to maintain the soil moisture.

a. Raspberry Pi module

In this project Raspberry pi acts an sever where the data from arduino is stored. Raspberry Pi 2 is a second generation Raspberry Pi and delivers 6 times the processing capacity and has an upgraded Broadcom BCM2836 processor. BCM2836 processor is a very powerful ARM Cortex-A7 based quad-core processor, which runs at 900MHz [4]. Figure 2 shows the Raspberry Pi 2 model B. this model contains Secure Digital (SD) Card slot, USB port, Ethernet port, HDMI port, Status LEDs, Analog Audio output, Composite video out, Power input, etc.

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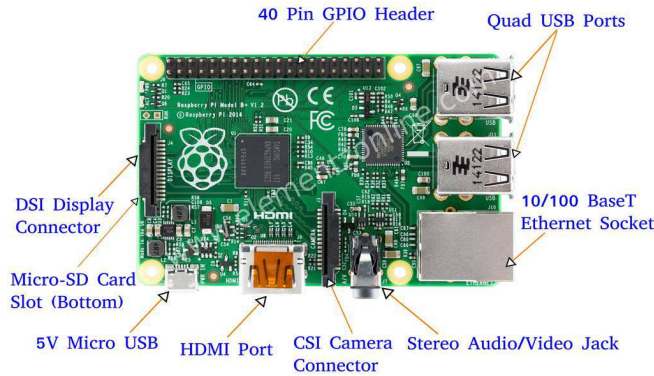


Figure 2 Raspberry Pi 2 model B

b. Arduino Uno

Arduino Nano is used to convert analog input signals from sensors into digital signals which are given as an input to raspberry pi. It provides an interface between sensors and the Raspberry pi and consists of analog interface pins from A0- A7. The sensors output, in the form of analog, are interfaced with the arduino nano's analog pins and also be monitored on serial monitor provided by Arduino programming software, shown in the figure 3[4].

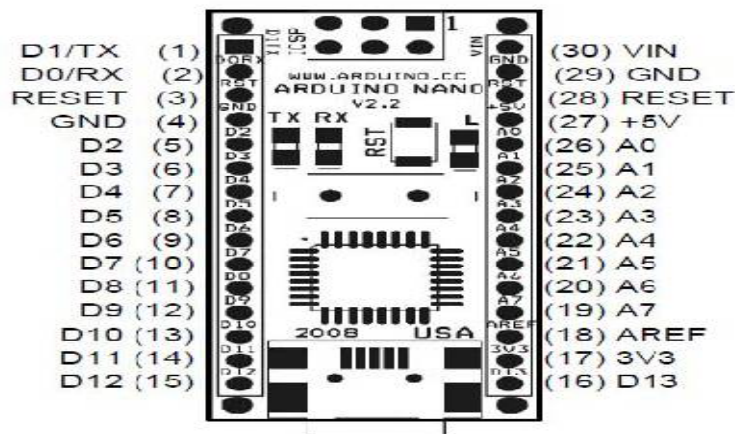


Figure 3 Arduino Nano Pin Layout [4]

c. GSM Modules

The GSM module is used to provide the Message facility to the registered user. The message is delivered when input from sensors crosses certain threshold value. The figure 4 shows the hardware features of the SIM900A GSM module is a Dual-band GSM/GPRS module in a SMT type and delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax.

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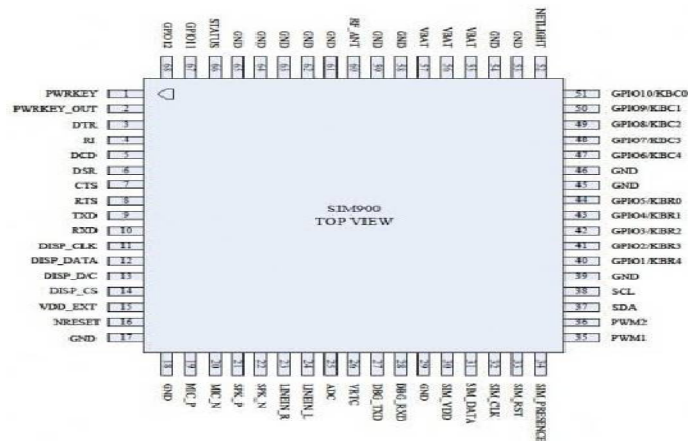


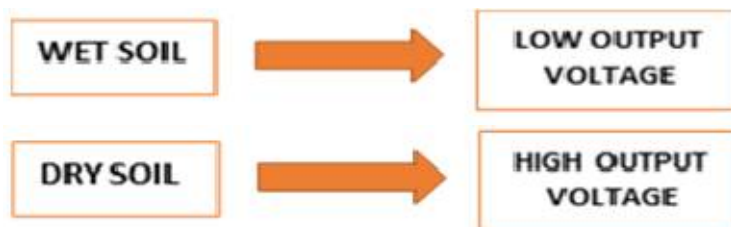
Figure 4 Pin diagram of GSM module

d. Sensors

Following sensors are used in the system.

- Soil moisture Sensor

The volumetric water content in soil is measured by the soil moisture sensor. soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Soil moisture sensor measures the content of water in the soil. It consists of two probes which are used to measure the volumetric content of water. The two probes allow the current to pass through the soil and then it gets the resistance value to measure the moisture value. When the water content is more, the soil will conduct more electricity which means there resistance is less. Therefore, the moisture level will be high. When the soil is dry , conduction of electricity is poor, so when there will be less water, then the soil will conduct less electricity which means that there will be more resistance. Therefore, the moisture level will be lower.



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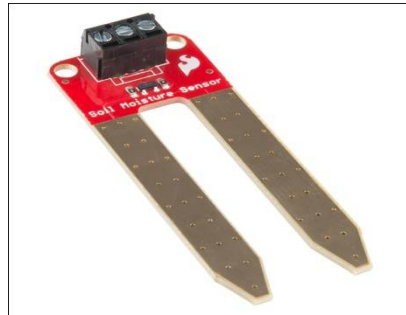


Figure 5 soil moisture sensor

- **Temperature and Humidity Sensor**

DHT11 sensor is used as Temperature & Humidity Sensor and it includes a resistive-type humidity measurement component, and connects to a high-performance 8-bit microcontroller. Being a mixed sensor it provides with the values both of temperature and humidity. The sensor calibers digital signal output. This sensor gives greater stability and higher reliability. It offers excellent quality, fast response, anti-interference ability and cost-effectiveness and also it provides the temperature range between 00 -550C and Humidity range between 20-90% [5].

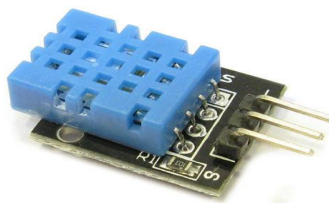


Figure 6 DHT11 sensor

d. Output devices

The output devices used are 12 volt DC fan and motor. Fan is used to control temperature and humidity. Motor is used to pump out the water to maintain soil moisture.



Figure 7 12V DC Fan and water motor

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III. RESULT AND CONCLUSION

The designed system overcomes few shortcomings of the existing microcontroller based systems by reducing the power consumption, maintenance and complexity, at the same time providing a flexible and precise form of maintaining the environment for increasing the cultivation of crops and avail of facilities like internet connectivity, interfacing with camera and many more. Figure 5 shows the actual output of the system.

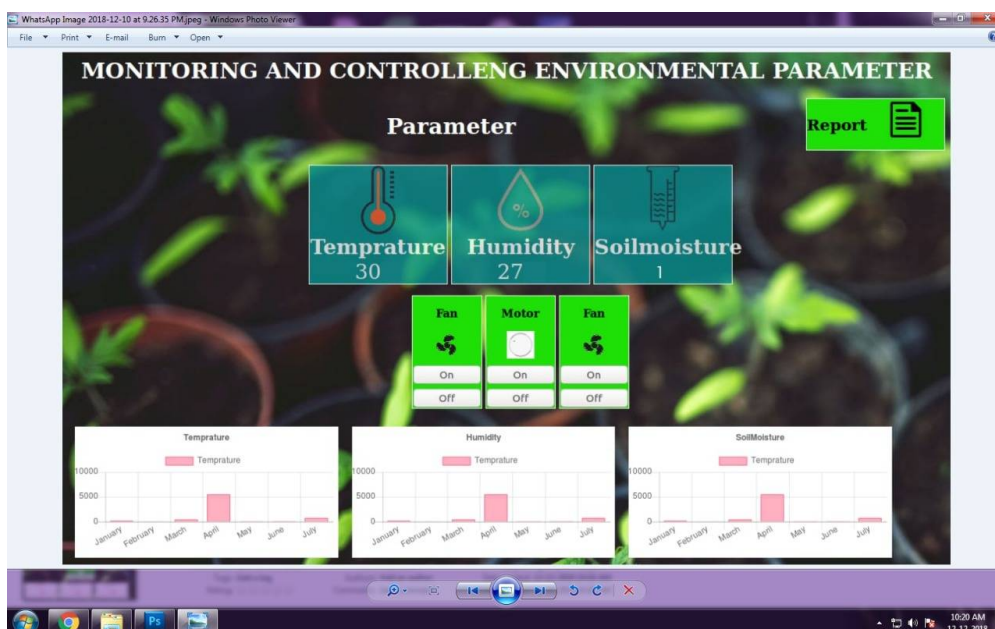


Figure 8 Actual output of the system.

REFERENCES

- [1] V. Chaithra, C. Harshitha, K. T. Shwetha, U. R. Sowmyashri and S Ramesh, "IoT based Automated Polyhouse Monitoring and Control System", International Journal of Research in Engineering, Science and Management Volume-1, Issue-5, May 2018.
- [2] Andrzej Pawlowski, Jose Luis Guzman, Francisco Rodríguez, Manuel Berenguel, José Sánchez and Sebastián Dormido, "Simulation of Greenhouse Climate Monitoring and Control with Wireless Sensor Network and Event-Based Control", Sensors, 2009.
- [3] Jayaty, Dhruv Binani and Mrs. S. Nagadevi, "IoT Based Polyhouse Monitoring and Control System", International Journal of Pure and Applied Mathematics, Volume 118, No. 20, 2018, pp. 4261-4265.
- [4] Akshay D. Deshmukh and Ulhas B. Shinde, "A Low Cost Environment Monitoring System Using Raspberry Pi and Arduino with Zigbee", International Conference on Inventive Computation Technologies (ICICT), IEEE, 2016.
- [5] <https://www.newark.com/arduino/a000066/dev-board-atmega328-arduino-uno/dp/78T1601>
- [6] Akash and Amit Birwal, "IoT-based Temperature and Humidity Monitoring System for Agriculture", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 6, Issue 7, July 2017, pp. 12756-12761.
- [7] Selvaraj Kattery Nanjundiah, "Challenges and Prospects of Horticultural Production in India under Free Trade Regime", ResearchGate, 2015.