

Data Acquisition and Supervisory System for Temperature & Humidity Control in Greenhouse

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ABSTRACT

The present paper describes the technology to control the parameters like temperature and humidity in greenhouse environment using data acquisition system and Lab-VIEW technique. For the large rural district, the greenhouse production has become a way of being rich. It is important to real timely and properly measure and adjust the temperature and humidity in greenhouse environment. A greenhouse environment parameters monitoring system based on wireless communication technology has been developed it overcomes the disadvantages of wired monitoring system, such as complicated wiring, and difficult maintenance. The environmental parameters in every greenhouse were measured and controlled by microcontroller. The experimental results show that the developed monitoring system has the following features, such as simple structure, high reliability, good extensibility and flexible configuration. It can control and adjust automatically the environmental parameters in every greenhouse system.

Key words: Data acquisition system, Lab-VIEW, microcontroller, relay, sensor, VRS

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INTRODUCTION

With the continued expansion of production scale in greenhouse it is important to real-timely and properly measure and adjust the temperature, humidity and other parameters of crop in greenhouse environment. For the large rural district, the greenhouse production has become a way of being rich. In this paper a greenhouse environment parameters monitoring system based on wireless communication methodology has been developed, which realizes the measurement and control of temperature, humidity and the other parameters. A wireless measurement and control system overcomes the disadvantages of wired monitoring system, such as complicated wiring, and difficult maintenance. The environmental parameters in every greenhouse were measured and controlled by microcontroller. DAQ (Data Acquisition) is the process of taking a real-world signal as input, such as a voltage or current any electrical

input, into the computer, for processing, analysis, storage or other data manipulation or conditioning. The paper deal with the programing language Lab-VIEW is a powerful tool that can be used to help achieve the desired goals. Its graphical nature makes it ideal for Test and Measurement automation, instrument control, data acquisition, and data analysis applications. Previous techniques is use to monitor and control the required environmental parameters for the particular crop It is particularly crucial to analyze the methods which can effectively manage the proper environment. But here in this paper a wireless sensor network for the large area is now becoming popular in greenhouse technology of precision agriculture. Figure 1 shows typical wireless sensor nodes. Wireless sensor nodes are very small devices that with limited battery source. They are capable to collect the environmental data with precise sensors and are able to transmit it to control station with high efficiency.

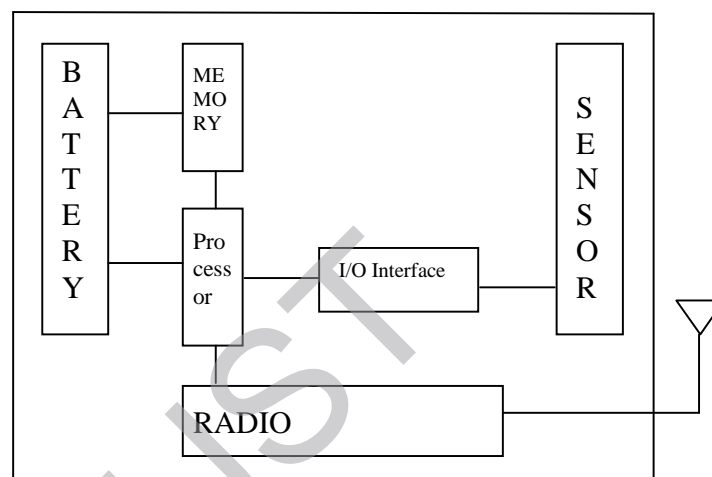


Fig.1. Typical wireless sensor nodes

WORKING

Sensors are mounted on Data Acquisition System. The DAQ System has some electronic component such as resistor, transistor, wire bus, connectors, LEDs for indication, LCD for display, microcontroller, and relay for output. These all components are perfectly designed for manipulate, computed and controlled the Real parameter through environment, its designed are called DAQ System. Figure 2 represent the block diagram of model. The project is developed for industrial purpose as well as domestic purpose also which is sense the Temperature and Humidity at different places and control by AC (Air conditioner), heater and ventilator respectively. The real data (Temp. & Humidity) are sensed by sensor to environment. These digital data are transmitted from sensor to microcontroller for calculating and controlling the parameter after calculating data here controlled the field devices such as AC, Heater and Ventilator via relay. The LED is used for indication that the devices is ON or OFF. The project is required 12V power supplies which are gating to step down transformer.

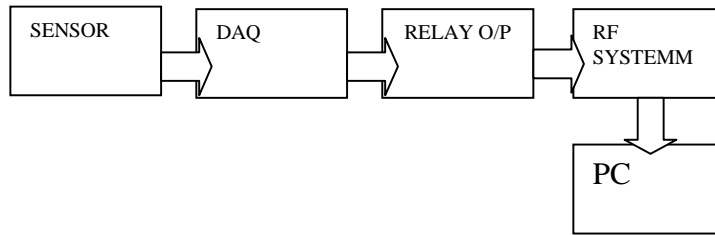


Fig.2. Block Diagram

These Data are transmitting on PC through RF signal (wireless system). The received Data are computed and controlled on Lab-VIEW software, this Lab-VIEW software is installed in PC. Figure 3 represent the typical circuitry of RF system.

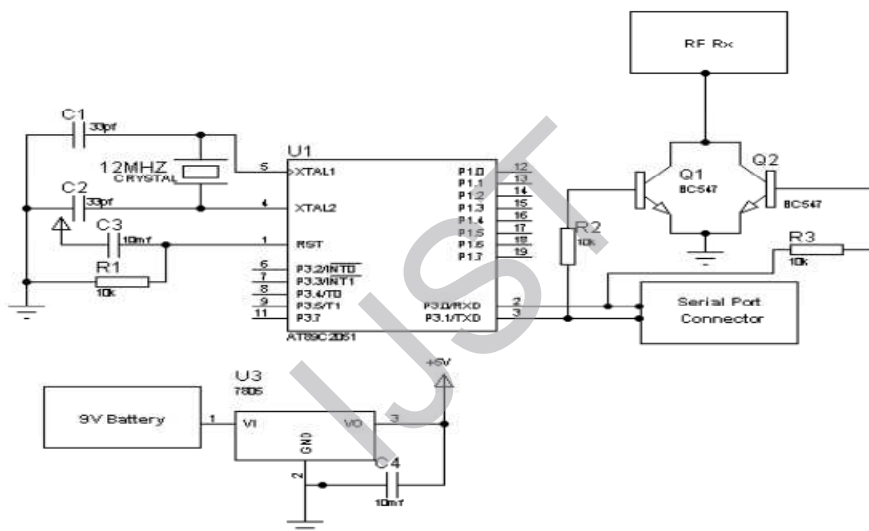


Fig.3. RF System Circuitry

The circuit diagram shows that the environment parameter such as Temperature and Humidity are controlled, manipulate and computed by the Data Acquisition System and transmit the data on PC via RF station. The output generate through relay. Lab-VIEW is a graphically-based programming language developed by National Instruments. Its graphical nature makes it ideal for Test and Measurement (T&M), automation, instrument control, data acquisition, and data analysis applications. Earlier techniques are available to monitor and control the required environmental parameters for the particular crop. It is particularly crucial to analyze the methods which can effectively manage the proper environment. We use of wireless sensor network for the large area is now becoming popular in greenhouse technology of precision agriculture.

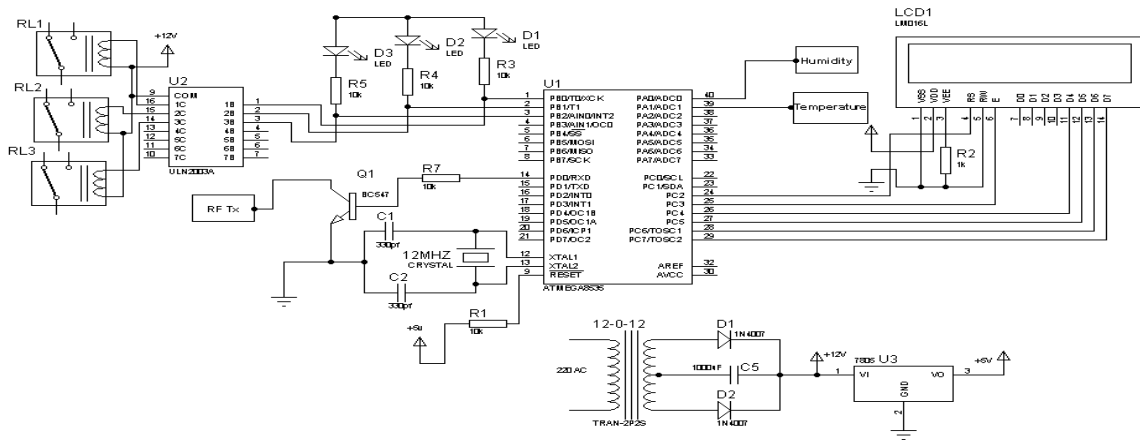


Fig.4. Circuit Diagram



Fig.5. PCB Circuit Design



Fig.6. RF Section

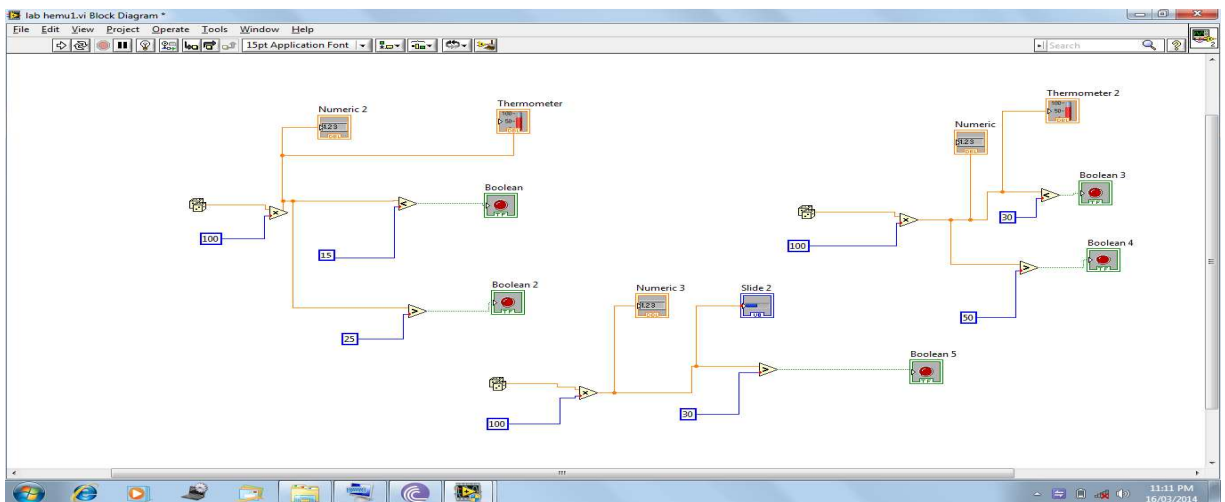


Fig.7. Block Diagram (Lab-VIEW Based)

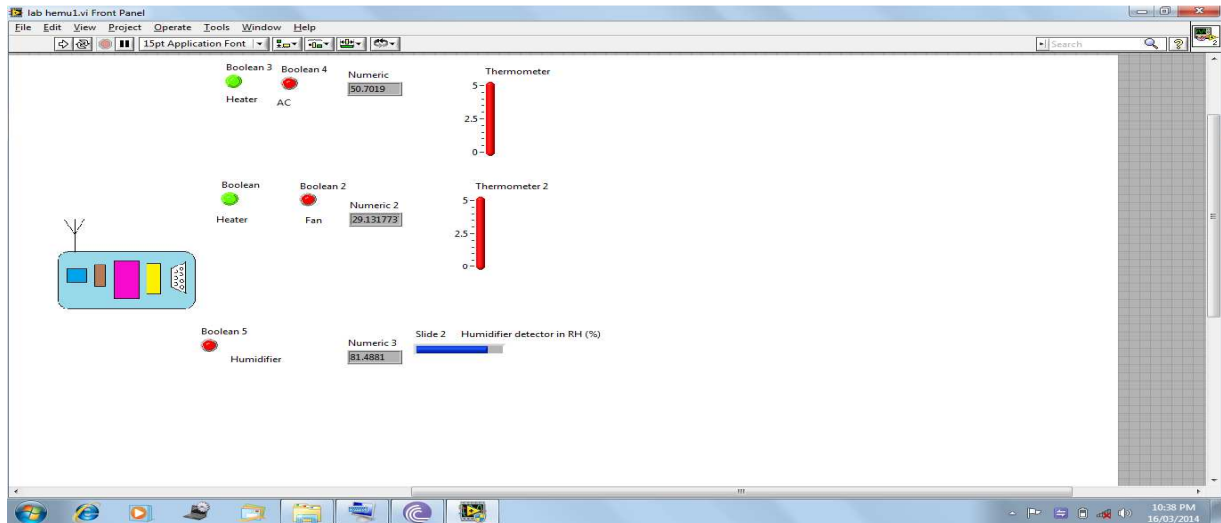


Fig.8. Simulation Diagram (Lab-VIEW Based)

Table 1 shows the different Temperatures (T_1 & T_2) in degree centigrade while time measured in milliseconds, at temperature T_1 20⁰C heater on and at 50⁰C air conditioner on, and at temperature T_2 2.25⁰C heater on and at 45⁰C air conditioner on. Table II shows the different humidity values at different time instant, at 80% humidity ventilator on.

Table1. Temperature versus Humidity

Time (mS)	10	100	1000	10	100	1000	10	100	1000
RH(%)	48	52	58	62	70	75	80	85	79

Table2. Time versus Temperature

Time (mS)	10	100	1000	10	100	1000	10	100	1000
Temp.1 ⁰ C	18	20	25	35	42	48	51	56	48
Temp.2 ⁰ C	27	32	35	45	50	49	43	38	25

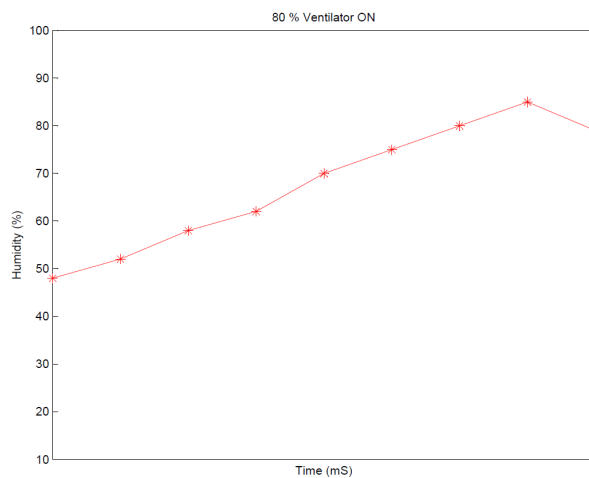


Fig.9. Humidity v/s Time plot

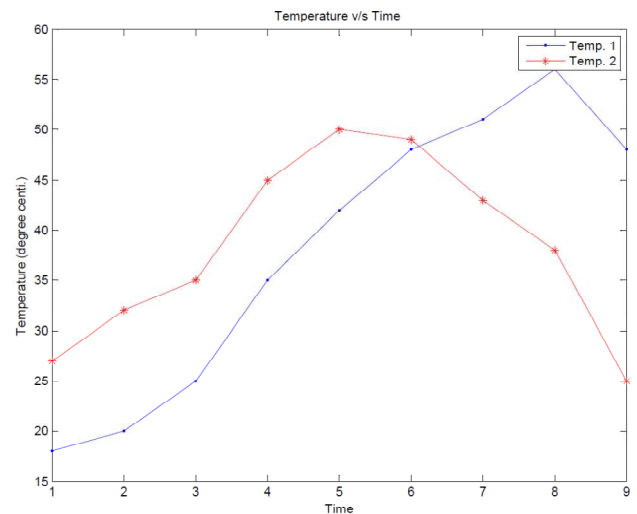


Fig.10. Temperature v/s Time plot

CONCLUSION

The measurement and control of greenhouse parameter like temperature and humidity has been implemented. The experimental results show that the developed monitoring system has the following features, such as simple structure, high reliability, good extensibility and flexible configuration references. It is applied to agriculture vegetable greenhouse can overcome the disadvantage of traditional measuring and controlling system in greenhouses, real time monitoring for temperature and humidity of greenhouse can be kept for long distance and the information can be obtained at any time instant, It has improved the complexity of system, not needing cables, low power consumption, cheap cost, good robustness, flexible extension, convenient installing over the traditional measurement and control system. It is concluded that the LAB-VIEW software is more sophisticated, reliable and give accurate result. LAB-VIEW software is supportable for engineering student for designing and also supportable for supervisory of the plant.

REFERENCE

- [1] Kang Weixin, "Design of Charged Wireless Communication Interface Based on Bluetooth Technique," Heilongjiang Institute of Technology, 16(3), pp.24-26, 2002
- [2] Tan Liang , Hu Ji, " Design of the Wireless Multi - Point Temperature Gathering System Based on nRF9E5," Journal of Hangzhou Dianzi University,8(4), pp.31-34, , 2006
- [3] Zhu Weihua, "Design of Wireless Data collection System Based on Single RF Transceiver," Nanhua University, 17 (2) pp.6-9, 2003

- [4] Zhang Baohua, Li Shining, Teng Wenxing, "Development and design of greenhouse testing and control system based on wireless sensor networks," *Microelectronics & computer*, 25(5), pp. 154-157, 2008
- [5] Zhang Weigang, "Communication principle and technology," Xi'an: Xidian university press, pp.182-185, 2002
- [6] Li Wenzhong, "Short-range wireless data communication entry and the actual combat," Bei hang University Press, pp89-93, 2002
- [7] Rick Bitter, Taqi Mohiuddin, Matt Nawrocki, "LAB-VIEW Advanced Programming Techniques," second edition book, National Instruments
- [8] John Park, Steve Mackay, "Practical Data Acquisition for Instrumentation and Control Systems," book
- [9] D.D.Chaudhary¹, S.P.Nayse², L.M. Waghmare "Application of Wireless Sensor Networks For Greenhouse Parameter Control In Precision Agriculture" *International Journal of Wireless & Mobile Networks (IJWMN)* Vol. 3, No. 1, February 2011.

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