Web Based Automatic Greenhouse Monitoring System For Agricultural Lands

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Abstract - Wireless Sensor Networks are greatly being deployed in day to day activities ranging from medicinal field, military applications to smart cities. Active research is done to increase the penetration of wireless sensor networks in all the fields to improve the efficiency of the existing systems. A major limitation of wireless sensor networks is its limited battery. To enhance the lifetime of the sensor nodes, various energy efficient techniques like new protocols in the physical layer, Medium Access Layer, routing protocols and cross layered protocols are proposed. One of the important applications in which the wireless sensor nodes are deployed nowadays is in Parameter monitoring and control of greenhouse environment which plays an important role in greenhouse production and management. This project involve a design and implementation of an IOT based Wireless Sensor Network (WSN) that is used to monitor and control the essential greenhouse parameters, such as, temperature, humidity and light intensity. This implementation supports the farmers to increase the crop production. The standalone IOT module, i.e., without microcontroller, is integrated with specific small size sensors. All monitored parameters are transmitted through a wireless link to computer via coordinator to be analyzed, and then initiated by suitable commands to the specific devices to overcome the drifts in an environmental parameters inside greenhouse. The overall system shows advantage in cost, size, power, flexibility and distributed intelligent. Internet of Things is a concept where each device is assigned an IP address and through that address, anyone makes that device identifiable on the internet. Ultimately it is a system that aims to increase the quality of life with the automation of appliances that may be controlled over the internet.

I. INTRODUCTION

Wireless Sensor Networks(WSN) are used in almost all fields in our life ranging from smart cities, structural health monitoring, habitat monitoring, hospital healthcare, industry automation to military. The WSN consists of many sensor nodes. Each sensor node is a low power device which contains sensors to sense one or more physical quantity, memory and a radio frequency transceiver to communicate with other sensor nodes along with a processor or controller. Majority of the sensor nodes are powered by a non-rechargeable battery and hence the lifetime of the sensor node is limited by the energy of the non-rechargeable battery. The sensor nodes gather information from the environment and transmit to the base station (BS) base on which further action is taken by the system or the intended user. Wireless sensor networks have the advantage of low installation cost, improved reliability and huge flexibility in reconfiguring the network to suit different application scenarios.

Existing system - There are several systems available on the market that are capable of monitoring the environmental factors in greenhouse.

"Wind land Enviro Alert" has the capability of monitoring up to four wired sensors and four wireless sensors. In this the users can have transmitter activate dialers call or activate alarms when the programmed thresholds are exceeded

"Watchdog wireless crop monitor" requires constant temperature and humidity monitoring. It uses remote sensing unit to measure and wirelessly transmit the temperature and humidity readings. It supports up to 16 sensing units are to be deployed within 300 meters of the base unit. In this distress alarm and warning light will activate when programmed thresholds exceeded.

Drawbacks - Its work up to 300 meters but it has disadvantage of sensing units are sold separately, high power consumption, don't support wireless mesh networking and finally it has no climate control capability.

The major drawback in this system is don't support wireless mesh networking, system configuration can be tedious and it has also no climate control capability.

The main weakness is system is not expandable and doesn't support wireless mesh networking.

II. PROPOSED SYSTEM

The proposed system consists of three parts, arranged hierarchically: Sensor Station (SS), Coordinator Station (CS), and Central Control Station (CCS). The SS is responsible for the collection of climate measurements data and transmits it to a CS. The SS consists of five commercial sensors. The Coordinator Station acts as a router that controls the flow of data and instructions between the Sensor Station and the Central Control Station in a pre-programmed manner. It also manages the local activities such as turning on/off sprinkler, humidifier etc. It communicates with the sensor stations using ZigBee wireless protocol and is thus restricted to short distance links. The ZigBee modules are interfaced to them icro controller of the coordinator station .It communicates with the central control station using Xstream RF modems.

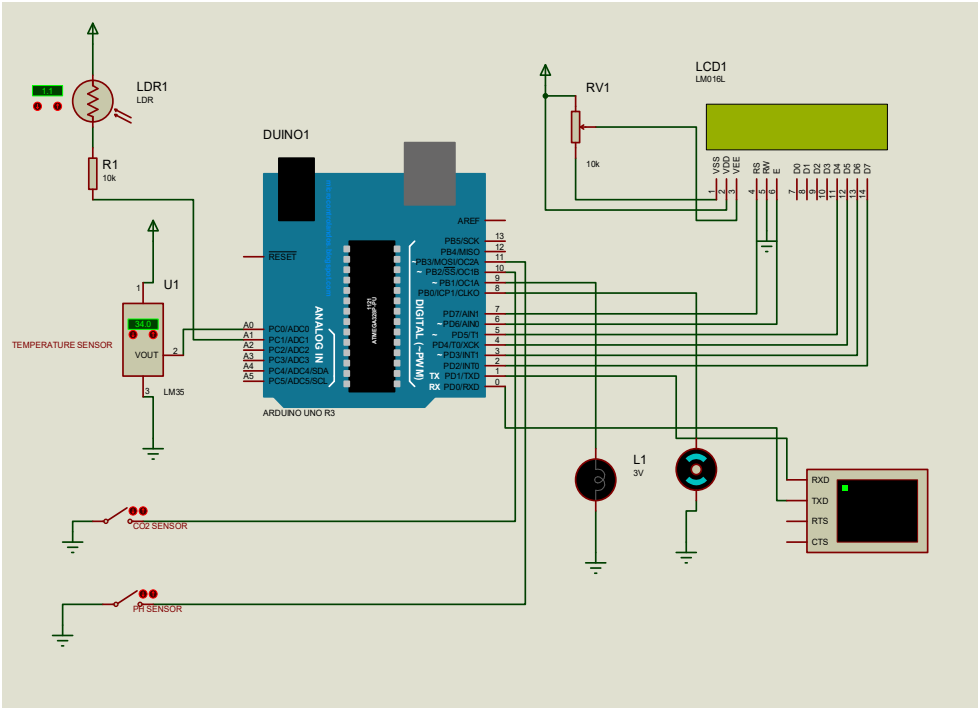

Figure 1- HARDWARE SETUP

BLOCK DIAGRAM OF THE PROPOSED SYSTEM:

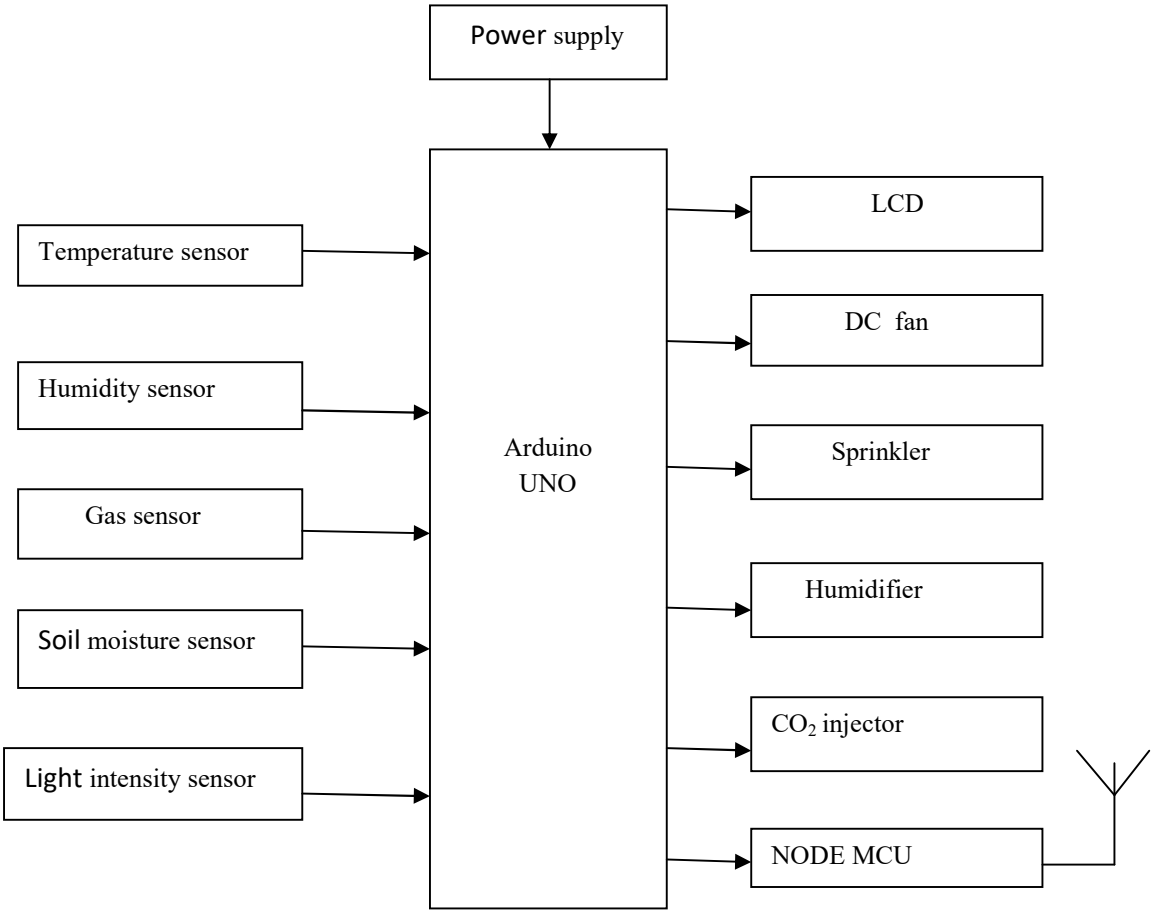

Figure 2- TRANSMITTER SECTION

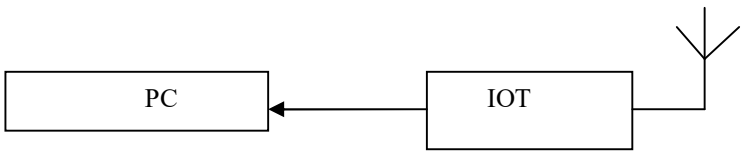

Figure 3- RECEIVER SECTION

Advantage

. The key advantage of our system is it is specially designed for greenhouse monitoring and easy to use, portable, cost effective, scalable and most importantly it can monitor and control the environment in a preprogrammed manner

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III. BASIC DESCRIPTION OF THE SYSTEM

HARDWARE MODULES
ARDUINO UNO CONTROLLER

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which six can be used as PWM outputs), six analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Arduino Uno differs from all preceding boards because it does not use the FTDI USB-to-serial driver chip. Instead, it features the ATmega8U2 programmed as a USB-to-serial converter. Revision 2 of the Arduino Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.

LIQUID CRYSTAL DISPLAY

LCD is used to display the results of the system operation such as sensed values, motor status etc..A liquid-crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. The LCD standard requires 3 control lines and 8 I/O lines for the data bus. The most commonly used Character based LCDs are based on Hitachi's HD44780 controller or other which are compatible with HD44580. In this tutorial, we will discuss about character based LCDs, their interfacing with various microcontrollers, various interfaces (8-bit/4-bit), programming, special stuff and tricks you can do with these simple looking LCDs which can give a new look to your application.

TABLE 1-RESULTS

Environmental factors	Temperature & humidity				Light intensity	
Threshold level	>34		<34		<0.1	>1.1
Output	Window	Fan	Window	Fan	Light	Light
	Open	On	Close	Off	On	Off

IV CONCLUSION

The design of a wireless climate monitoring system has been presented which is hierarchically organised as three stations – sensor station, coordinator station and the central control station. Each station has a predefined role. A large greenhouse will typically have several sensor stations.

Several sensors were evaluated for the system and calibrated against standard instruments. The system was integrated with sensor stations and tested in a greenhouse. Each sensor station had 6 sensors, one each for air temperature, humidity, CO2, soil temperature, soil moisture and light intensity. The wireless network was reliable and performed satisfactorily.

Now due to lack of equipment for the controlling of greenhouse climate, in future the developed controller was tested out in a sufficient greenhouse environment to accurately determine its reliability and capability. More sensors can be added to the sensing unit to monitor other environmental factors.

REFERRENCES

[1] Dae-Heon Park and Jang-Woo Park, Wireless "Sensor Network-Based Greenhouse Environment Monitoring Automatic Control System for Dew Condensation Prevention", Sensors 2011.

[2] Vu Minh Quan, Gourab Sen Gupta, Subhas Mukhopadhyay, Review of sensors for greenhouse climate monitoring, Proceedings of Sensor Application Symposium (SAS 2011), 22-23 February, 2011, San Antonio, USA, pp. 112-118.

[3] Mohd Fauzi Othmana, Khairunnisa Shazalib, "Wireless Sensor Network Applications: A Study in Environment Monitoring System", Procedia Engineering, Elsevier.

[4] BeomJin, K., DaeHeon, P., KyungRyung, C., ChangSun, S., SungEon, C., JangWoo, P., A Study on the "Greenhouse Auto Control System Based on Wireless Sensor Network",2009 .

[5] Werner-Allen, G., et al. monitoring volcanic eruptions with a wireless sensor network, in proceedings of the second European workshop on wireless networks., Feb 2005,pp.108-120.

[6] M. Danita, Blessy Mathew, Nithila Shereen, Namrata Sharon, J. John Paul " IoT basedAutomated Greenhouse Monitoring System", IEEE sponsored ICICCS 2018.

[7] Meijuan, G., Z. Fan, and T.Jingwen. Environmental Monitoring system with wireless Mesh Network Based on Embedded System in international symposium on embedded computing, oct 2008, pp 174-180.

[8] Giannopoulos,N., C.Goumopoulos, and A. Kameas. Design Guidelines for Building a wireless sensor network for environmental monitoring in 13th panhellenic conference on Informatics, sep 2000, pp.147-154

[9] Burrell, J., T. Brooke, and R. Beckwith, Vineyard computing: sensor networks in agricultural production. Pervasive computing, IEEE,2004, 3(1): pp.38-45.

[10] Qian, G. and C. Ming, Research and design of web based wireless sensor network management system for Greenhouse, in proceedings of the 2008 ICCEE. Pp.657-661.

[11] Parameswaran, G., Sivaprasath, K, "Arduino Based Smart Drip Irrigation System Using Internet Of Things" IJESC, Volume 6 Issue No. 5,2016.

[12] Ahonen, T., Virrankoski, R., Elmusrati, M., "Greenhouse Monitoring with W ireless Sensor Network". Proceeding of Mechtronic and Embedded Systems and Applications, 2008..

[13] Mohd Fauzi Othmana, Khairunnisa Shazalib, "Wireless Sensor Network Applications: A Study in Environment Monitoring System", Procedia Engineering, Elsevier.