Wireless Sensor Network Based Greenhouse Monitoring and Control System

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Abstract— To obtain the best results from green house system, continuous monitoring and control system is required. This paper proposes a WSN based design to monitor and control the essential greenhouse parameters, such as, temperature (LM 35), humidity (HSY230) and light intensity. Here a main node is connected to the computer to analyse the input in visual basics and then produce the required output. All the parametric data is been sensed by the respective nodes and send to the main node via RF ZIGBEE (CC2520). The main controller ARM7 (LPC2138) will then send the data to the computer. Here the analysed input will get compared to the required output (pre-determined) in visual basics. the necessary changes will be send to the main node which will then transmit the signal to the respective nodes PIC CONTROLLER (16F877A) via ZIGBEE. The nodes will then initiate suitable commands to the specific devices to overcome the drifts in environmental parameters inside greenhouse. Making the system wireless will help in reducing the hardware cos and also increases the area for crop production.

Key words: ARM7, LM 35, HSY230

I. INTRODUCTION

In an agriculture based country like India, were farming is having an utmost importance. It is very important to make the best use of the available land for farming and production. Greenhouses are very useful as they provide an optimal temperature around plants, protect them from weather extremes, extend the growing season for producing crops more successfully. WSN based system can play a useful role in the automation system architecture of modern greenhouses. As Compare to the wired systems, WSN is fast, cheap and easy to .it is very convenient to relocate the position of nodes in the system. The automation of the greenhouse system will help in detecting as well as managing the required environmental changes. Till now many research and projects have been done in order to improve the conditions and cultivation of crops under greenhouse: IJCSMC proposed a research paper on Wireless Monitor and Control System for Greenhouse involve a design and implementation of an XBee 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 XBee module, i.e.,

without microcontroller, is integrated with specific small size sensors. School of Electronic Engineering, Huaihai Institute of Technology, Lianyungang, China made a Design of Wireless Sensor Network-Based Greenhouse Environment Monitoring and Automatic Control System a scheme based on wireless sensor network (WSN) is presented, which adopts Atmega128L chip and CC2530 that is a low power RF chip

from TI to design the sink node and sensor nodes in the WSN. The monitoring and management center can control the temperature and humidity of the greenhouse, measure the carbon dioxide content, and collect the information about intensity of illumination, and so on. And the system adopts multilevel energy memory. It combines energy management with energy transfer, which makes the energy collected by solar energy batteries be used reasonably.The main objective of the present work is to design and implement wireless sensor network using zigbee technology which forms a connection between the parent node and the sensor nodes so as to obtain the current value of the environmental parameters involving temperature, humidity, and light intensity. These values are then compared to the required output in visual basics and then required changes are transmitted back to to the sensor node via zigbee from the parent node.

II. BLOCK DIAGRAM
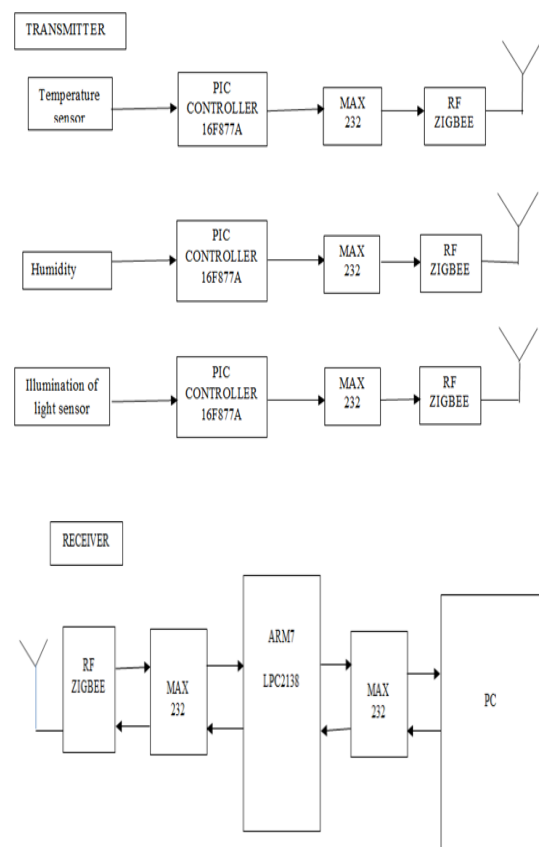
A. Block Diagram Description:

Block diagram consists of:
1) Temperature sensor (LM35)
2) Humidity sensor (HSY230)

3) Illumination of light sensor
4) PIC controller (16F877A)
5) MAX 232
6) RF ZigBee (CC2530)
7) ARM7 (LPC2138)
1) Temperature sensor (LM35)

The LM35 is precision integrated-circuit temperature sensor device with an output voltage linearly- proportional to the Centigrade temperature. LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling.

2) Humidity sensor (HSY230)
The HSY203 is humidity sensor which measures the amount of humidity. This module converts the relative humidity to the output voltage. There are three types of humidity sensors: capacitive, resistive and thermal conductivity humidity sensors.

3) Illumination of light sensor
The light intensity in the greenhouse is sensed by a photo sensor and a signal in the form of voltage is sent to microcontroller. A photo sensor is a complete assembly that includes the optical arrangement and electronic circuitry that is coupled to an electronic component called a photocell. The electronic circuitry amplifies the dc voltage generated by the photocell and after comparing it with reference voltage sends an appropriate signal to control device.

4) PIC controller (16F877A)
This microcontroller is high-performance RISC CPU. It has up to 8K x 14 words of FLASH Program Memory, up to 368 x 8 bytes of Data Memory (RAM) Up to 256 x 8 byte of EEPROM data memory. Microcontroller is used for interfacing with ZIGBEE and PC.

5) MAX 232
The MAX232 is widely known integrated circuit used for the serial communication between microcontrollers and PCs. MAX232 is used to convert TTL/CMOS logic levels to RS232 Logic levels during the serial communication processing. The drivers provide TIA-232 voltage level outputs from a single five volt supply via on-chip charge pumps and external capacitors.

6) RF ZigBee (CC2530)
ZigBee is a radio frequency (RF) communications standard based on IEEE 802.15.4. ZigBee is a short range wireless communication technology, representing a wireless sensor network which is highly reliable, secure, low data rate, low power consumption, low cost and fast reaction. The Zigbee is responsible for creating and maintaining the network.. The communication between the transmitter stations and the receiver station is achieved via ZigBee.

7) ARM7 LPC2138
The LPC238 microcontroller is based on a 32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine the microcontroller with 32 kB, 64 kB, 128 kB, 256 kB and 512 kB of embedded high-speed flash memory. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at maximum clock rate. Due to their tiny size and low power consumption, these microcontrollers are ideal for applications where miniaturization is a key requirement

III. ALGORITHM

− START
− Provide multiple sensor nodes for temperature, humidity and intensity of light
− Collect the data from sensor nodes and send the data to parent node
− Parent node will analyze the data and send it to the PC
− Compare the data in visual basic with predefined data.
− Send the control signal to the parent node
− Parent node will send the data to the sensor nodes
− Command the actuators accordingly
− STOP

IV. EXPECTED RESULTS

The greenhouse agriculture is developing very fast with the increasing demand of fresh vegetables in the large and medium cities So the proposed system will change the plant growth environment, create optimum condition for plant growth, and keep out of the environment changes and the influence of atrocios weather.

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