Autonomous Environmental Parameters Monitoring System Using ZigBee

Ms. Shweta S. Badgi, Prof. N. A. Dawande

Abstract—**In greenhouses several measurement points are required to note down the local climatic parameters in different parts of the big greenhouse to make the greenhouse automation system work properly. This paper presents design and development of environmental applications monitoring using ARM7 and ZigBee. For sensing different environmental parameter, the sensors are used and for wireless communication ZigBee trans-receiver is used.**
The basic idea is that which can be carried out to provide an efficient control mechanism greenhouse through the implementation of an infrastructure of Wireless Sensors Network to using environmental parameters.Here the autonomous expansion of the monitoring system is being used i.e if one slave which is not in the range of the master but it is in the range of the slave which is in turn is in the range of the master then its contents will be accessible by the master unit. The different types of sensors used are temperature, light and humidity. ZigBee wireless sensor network is used as a communication platform for real-time monitoring.

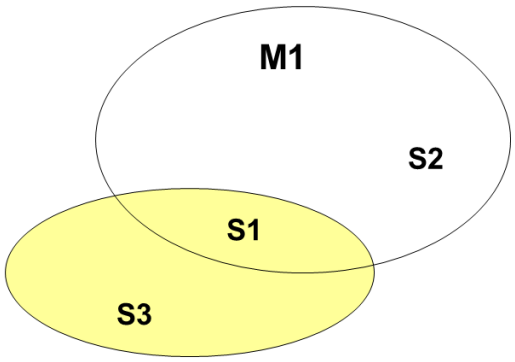
Index Terms—**ARM 7, Greenhouse, WSN, ZigBee, Sensors.**

I. INTRODUCTION

The function of a greenhouse is to create the optimal growing conditions for the full lifecycle of the plants [3]. Continuous advancements in wireless technology and miniaturization have made the deployment of sensor networks to monitor various aspects of the environment increasingly flexible. It introduces a wireless sensor network that was used for the purpose of measuring and controlling the greenhouse application. Climate monitoring is vitally important to the operation in greenhouses and the quality of the collected information has a great influence on the precision and accuracy of control results. Currently, the agriculture market field incorporates diverse data acquisition techniques.

Traditionally to monitor the climate and control systems, all sensors are wide spread through the greenhouse and connected to the device performing the control tasks.The applications of WSNs typically include monitoring, tracking, and controlling. In a typical application, a WSN is spread over in a region where it is meant to collect data through its sensor node. To make the greenhouse automation system work properly several measurement points are required to trace down the local climate parameters in different parts of the big greenhouse. If cabling is used for the measurement system, then this would make the system vulnerable and expensive. Moreover, the cabled measurement points are difficult to relocate once they are installed. Thus, a wireless sensor network (WSN) consisting of small-size wireless sensor nodes equipped with radio and one or several sensors, is an attractive and cost-effective option to build the required measurement system.

II. OVERVIEW OF THE SYSTEM



In our system we have

- One master PC terminal
- Three slaves terminals

In total we have 3 slaves. The idea is that if one slave goes out of range of the PC then communication fails. So we are placing three slaves which will be placed in such a way that they will be always in the range of PC master. Therefore PC master will communicate to slaves via wireless ZigBee module.

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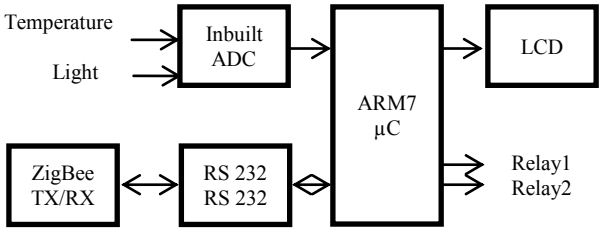
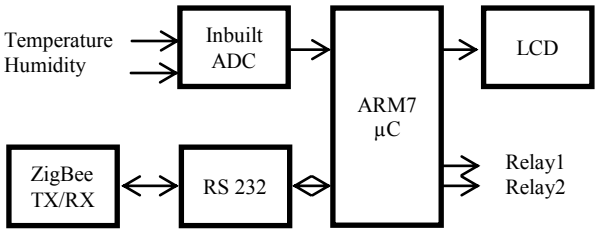
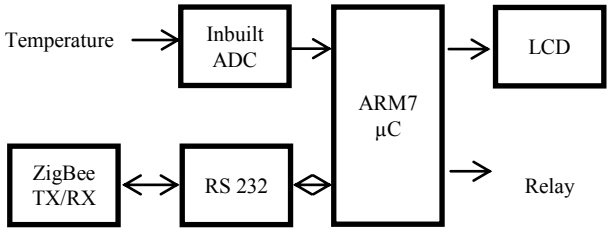
III. BLOCK DIAGRAM



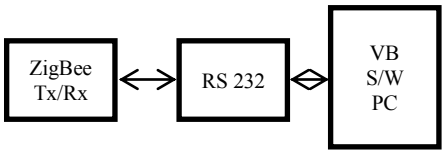
Slave 1



Slave 2



Slave 3



Master Terminal

As one can see the system basically consists of three slaves and one master terminal. The ZigBee trans-receiver is used for sending and receiving the data through WSN. Here the main PC master terminal has the VB software on it which monitors the status of all the slaves which covers the whole area using a Master Request and Slave Response.ARM7 microcontroller is used to convert the data received from the sensor to digital form and display it on the LCD. The different types of sensors used for the project are temperature sensor, light sensor and humidity sensor.The PC master will communicate to the slaves through wireless ZigBee module and RS 232. In this system for communication we are using

1) Collision Avoidance Protocol
2) Co-operative Communication
3) Nearest Neighbor Protocol

IV. HARDWARE DESIGN

The requirement of the hardware components used to implement this system are summarized as follows:

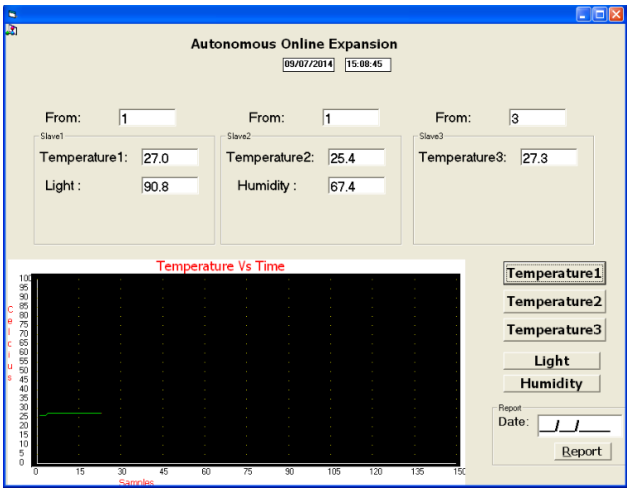
1. ARM 7TDMI (LPC 2138) [13], [14], [15]
2. ZigBee [9]
3. Temperature Sensor [LM35D]
4. Light Sensor[LDR]
5. Humidity HY 220 [16]

V. SOFTWARE DESIGN

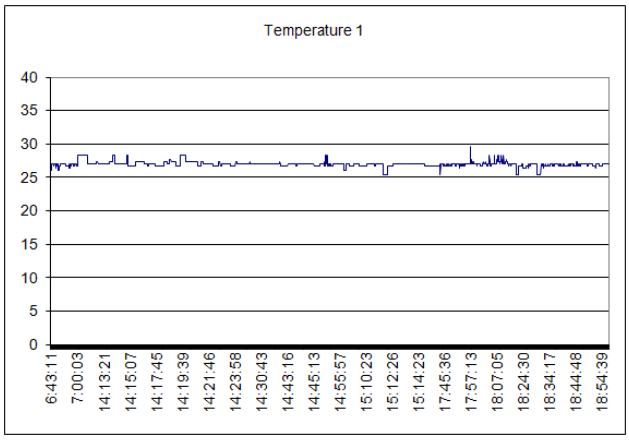
The interactive software is developed to do reliable monitoring and management of sensed data. The system software is made using Visual Basic which helps to form graphical user interface i.e. the parameters can be displayed in forms of bar chart, table and graphical display. Also, it can print the reports of the parameters generated. The different environmental parameters received by the ground control PC are displayed in the manner as required on the LCD screen. The different parameters are the temperature, humidity, etc. The computer stores the parameters in the hard disk.

VI. RESULT

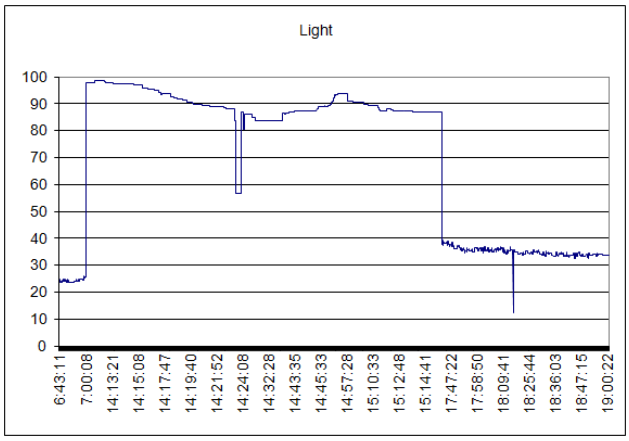
The VB screen display and the variation in the temperature, light and humidity graph is shown below.



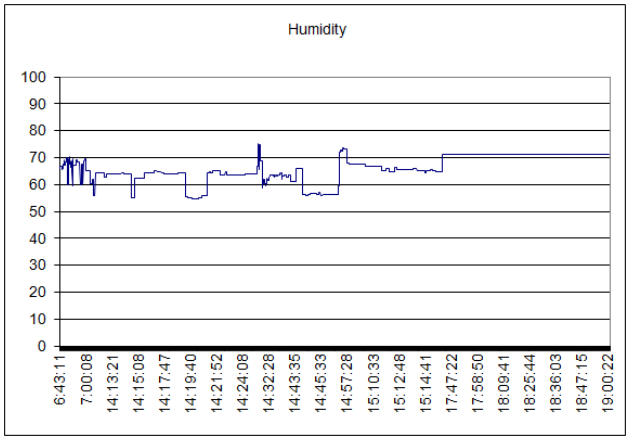
Visual Basics Screen Display



Variation in Temperature



Variation in Light Intensity



Variation in Humidity

VII. CONCLUSION

The values of the parameters are displayed on the PC. The developed kit has fast execution speed. For the conceptual demonstration the sensors used are general. The temperature and light sensors show good sensitivity. The ZigBee communication is noise free. ZigBee and LPC2138 provide low power platform. With use of sophisticated sensors, the system can work with more accuracy in real time. It can be modified in industrial monitoring as well.

In this system one node is operated on battery with the provision of power supply also. This is done to make the sensors mobile instead of fixed in one place.

In this system the collision avoidance protocol and nearest neighbor protocol is used. This project can be implemented by using AODV protocol.

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