

Polyhouse Monitoring And Controlling Using Wireless Sensor Network

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Abstract— To control and monitor the environmental parameter inside Poly-house, using wireless sensor network. This sensors not only sens it also send and received data. Telecommunication is a science of sending and receiving information such as sound, visual images, or computer data, over long distances through the use of electrical, radio, or light signals, using electronic devices to encode the information as signals and to decode the signals as information. Wireless communication is the transfer of information between two or more points that are not connected by an electrical conductor. The design a wireless sensor network using co-operative communication based on RF(IEEE 806.15.4) data acquisition system in view of the complicated cables and to overcome the problem of potential loss of data. Combined wireless RF(IEEE 806.15.4) communication technology with data acquisition system, we build wireless data acquisition system based on ARM7 processor and RF(IEEE 806.15.4) chip in the wireless sensor network which can reduce the cable Connections. This system, which is comprised of IEEE 806.15.4 network and database management system, has many important advantages such as low cost, low power Consumption, and low Date rate.. The major difference between RF(IEEE 806.15.4) data acquisition system and other data collector is that it realizes wireless data transmission after the A/D conversion. Furthermore, the system is simpler, integrated, anti-interference, stronger mobility and practicability. The system dedicates to automatic data collection and control.

I. INTRODUCTION

Traditionally, the workers in the industries need to take the readings of parameters in different areas to maintain the data as well as to main the operating conditions in the plant. The existing monitoring systems mostly use cable network. This kind of a network has poor performance as far as expansion is concerned. The cables have high incidence of failures due to aging and wear out. When the working surface is expanded, area to be monitored also increases and hence the new cost for installation and maintenance is needed. We design a wireless sensor network based on Zigbee/RF(IEEE 806.15.4) data acquisition system in view to minimize manual interaction and accident potential in the process of data acquisition of an embedded system. Also traditional parameter measurement and monitoring system has high possibility of potential loss of data; same is reduced in Wireless sensor network using co-operative communication system.

Through researching the characteristic of main wireless communication protocol, RF(IEEE 806.15.4) is chosen as lower layer communication protocol. With this application, the Standard is optimized for low data rate, low power consumption, security and reliability.

ARM7 is used to maintain high accuracy. Wireless sensor Node will collect the data using different sensors. Temperature Sensor is used to sense the temperature at each node. The sensor used for temperature is calibrated in directly degree Celsius with Sensitivity +10mv/C. Output range for this sensor is 4 to 30 volts and operating current is 60 μ A. MQ is used as gas sensor with high sensitivity to methane, Iso butane. Output range for this sensor is 1 to 3 V DC. LDR is used as it is highly sensitive to light with range of 1 to 3 V DC.

The output from sensors is in the form of analog signal. This signal is fed to ADC which will convert it into digital form. Once converted into digital form, the microcontroller can process the digital signal as per the application. The digital signal is then applied to ARM controller. The ARM Controller LPC2138 is used. The RF(IEEE 806.15.4) module is interfaced to ARM controller. Here the RF(IEEE 806.15.4) module works on TTL Txd and Rxd pins. LCD will display the data at each wireless sensor node. Relays are used for controlling action. RF(IEEE 806.15.4) Modules were engineered to meet RF(IEEE 806.15.4)/IEEE 802.15.4 standards and support the unique needs of low-cost, low-power wireless sensor networks. The modules require minimal power and provide reliable delivery of critical data between devices. The modules operate within the ISM 2.4 GHz frequency band and are pin-for-pin compatible with each other. There are three analog sensors interfaced with the ARM microcontroller. ARM microcontroller has in build 10 bit ADC. The output of these 3 sensors is fed at the input of ADC. ADC will convert the analog signal into digital form and then the microcontroller will perform the necessary operation. Microcontroller 89C52 is used for Sub master units. In our system most of the components used require 5 V as operating voltage. The total current, which our circuit sinks from the power supply, is not more than 100 mA. We have used Regulator IC 7805 that gives output voltage of 5V. The minimum input voltage required for the 7805 is near about 7V. Therefore we have used the transformer with the voltage rating 230v-10v and current rating 500 mA. The output of the transformer is 12 V AC This Ac voltage is converted into 12 V DC by Bridge rectifier circuit. Microcontroller used for sub master units is 89C52 which has following features.

1. 40 Pin I/O (P0.0-0.7 , P1.0-1.7 , P2.0-2.7 , P3.0-3.7)
2. Reset Pin NO. 9 (Active High)
3. Crystal Pins AT 18 -19 Pin
4. 1 Serial half duplex port (P3.0 (RX.) – P3.1 (TX.))
5. Interrupts (P3.2 (INT0)- P3.3 (INT1))
6. 2 Timers (P3.4 (T0)- P3.5 (T1))

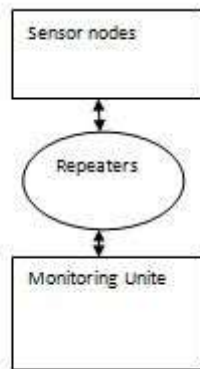


Figure1. Block diagram of Wireless Sensor Network

ARM7 provides following advantages:

- 1) High Performance.
- 2) Very low power consumption.
- 3) Compressive on-chip debug.
- 4) Design flexibility and scalability.
- 5) Optimal price
- 6) Fast growing support eco-system

II.SYSTEM IMPLEMENTATION

At regular interval PC Master will send the request for data to wireless sensor node through sub masters. The request will be sent in the form of frames. The frame transmitted by PC master will contain the sub master id as well as the wireless sensor node id from where the data is to be retrieved. The sub master upon receiving the frame will then check for the wireless sensor node id and will retransmit the frame as it is.

If one of the sub masters fails then the other sub master can also send the data of the other wireless sensor node. The RF(IEEE 806.15.4) module is interfaced to ARM controller. The wireless sensor nodes who are in range receive the incoming frames and stores in the internal RAM memory. If the incoming slave ID matches with their own slave ID then they accept the frame and send the parameter back to the master .If the ID does not match then the slave discards the frame. Wireless sensor nodes will measure the different parameters like temperature, light intensity and Gas and will send back the data to PC master through sub master units. The data will also be displayed on LCD. Relays are provided for controlling action. If the parameters at one of the wireless sensor node are not as per the expected, then the controlling action will be taken by the PC master terminal.

We have a main PC master terminal which has the VB software on it .The PC master terminal is used to monitor the status of all the wireless sensor nodes which covers the whole area. This reduces large cable connections and accidental potential due complex of cables. RF(IEEE 806.15.4), namelyIEEE802.15.4 technology standard, is one of WPAN standards. RF(IEEE 806.15.4) aims at short distance double direction communication with lower complexity, lower cost and lower speed. It works in three frequency regions-2.2 GHz internationally, 868MHz in Europe and 915MHz in America

Software Details:

1. Programming of ARM 7 using embedded _C_ in KEIL software.
- 2.Through graphical user interface (Visual Basic) we can view the data in following formats.

- Tabular Format
- Graphical View

User can also view the historical data for any of the wireless sensor node.

III. CO-OPERATIVE COMMUNICATION

We are using cooperative communication technique to make sure that the wireless sensor node is always in range of the master. For this we use repeaters units. These units are basically repeater unit which will enhance the data signal when the slave is not in range of the master. Here the request is first given to the sub master's .The frame transmitted by master will contain the sub master ID as well as the wireless sensor node Id from whom the data is to be retrieved.The frame transmitted by PC master will contain the sub master id as well as the wireless sensor node id from whom the data is to be retrieved. If one of the repeaters is not functional then through the other sub master we will collect the data for wireless sensor node .Using this technique we will not have any loss of data from any of the wireless sensor nodes.

IV. ANTI-COLLISION TECHNIQUE

IV. ALGORITHM & FLOWCHART

1. Start
2. PC Master will send the request.
3. Sub master will receive the request and will send the same to wireless sensor node.
4. Wireless sensor Node will collect the data.
5. RF(IEEE 806.15.4) module will transmit the data to sub masters.
6. RF(IEEE 806.15.4) module connected to PC will collect the data from sub masters.
7. The data will be displayed graphically.
8. Stop.

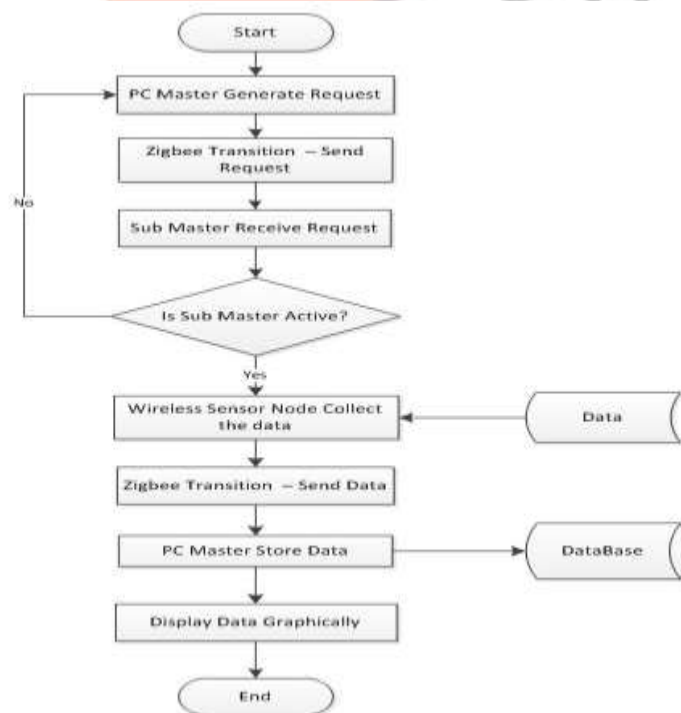


Figure2. Work Flow of Wireless Sensor Network

VI. COMPARATIVE ANALYSIS

TABLE I
COMPARISON BETWEEN CONVENTIONAL SYSTEM & PROPOSED SYSTEM

	Conventional Method	Proposed Method
Manual/ Automatic	Manual	Fully automatic
Data Error	Probability of Data Error is quite large.	Minimum
Speed of response	It is a slow process	It is very fast.
Man Power	Huge man power Required.	No man power required
Safety	No safety	Safe and Secure.
Man m/c Interface	Not possible	Possible

VIII. ADVANTAGES & APPLICATIONS OF SYSTEM

A. *Advantages of proposed WSN*

1. High Accuracy
2. Co-operative communication technique is used to avoid potential loss of data.
3. High Efficiency
4. High Reliability
5. High speed.
6. Simpler and highly practicable

B. *Applications of Proposed WSN*

1. Data Logging in hazardous application like gas plants, nuclear plants and chemical plants.
2. Wireless communication in industries.
3. It also finds application where it is difficult to measure and control the different parameters

Result :-

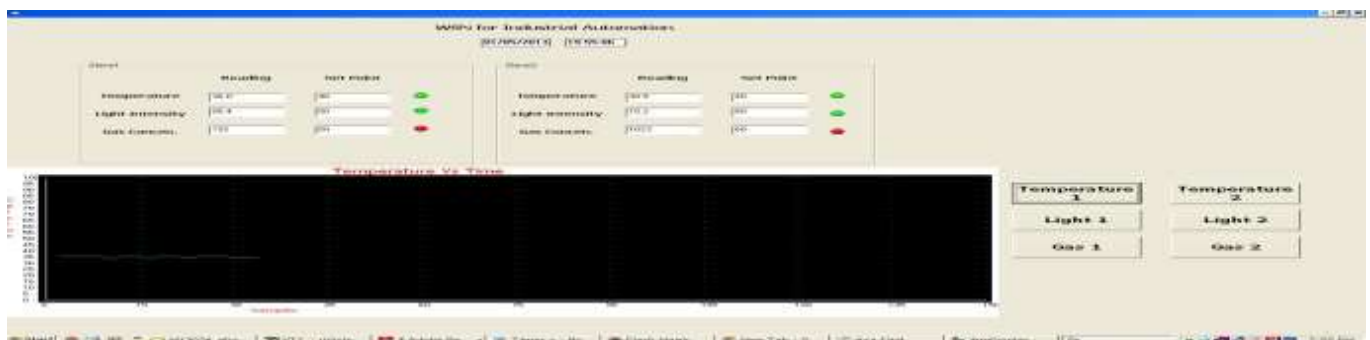


Figure3. Output of WSN on VB front.

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