

Survey on Implementation of Wireless Control Network using Zigbee

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ABSTRACT: A wireless sensor network WSN is used to send the received data from one node to the other node. Environmental parameters which affect the system performance and need to be control can be controlled remotely. To serve this purpose WSN and Zigbee is used. Mesh topology is used to form sensor network. The sensed data & control information is sent & received using the wireless technology Zigbee. The WSN work on Zigbee which having the speed for data transmission & Reception upto 250kbps. The ARM microcontroller is used to send & receive the data from the Temperature sensor, Humidity and smoke sensors are used to sense the Environment parameters. Parameter values are displayed on LCD. The central computing unit receives the data and displays it on PC.

KEYWORDS: ARM 7, Temperature, Zigbee, WSN etc.

I. INTRODUCTION

Mobile technology and recent research on embedded technology leads to develop intelligent device, all pervasive and effectively invisible to the user. As the field of communication networks continuous to evolve a very interesting and challenging area of wireless sensor networks is rapidly coming of age[1],[3].

A wireless sensor network (WSN) senses the environmental parameters such as humidity, temperature, sound, pressure, etc. and to pass their data through the network to a remote location. This data is monitored and controlled from this remote location. The military application motivated the wireless sensor development such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring [2].

This system is consists of ARM 7 Microcontroller and Zigbee node. Three different physical parameters are considered and monitored through this system temperature; humidity and smoke are these parameters. All the parameter values are sends to the remote station by using the Zigbee transceiver module. ADC is inbuilt in ARM 7 microcontroller. These three sensors are connected to the input terminals of the ARM 7. As per software programmed in Microcontroller it scan all the input terminals read and display sensed parameter value on LCD screen and in real time send this data to remote terminal by using Zigbee module. With Zigbee bidirectional communication is possible, hence from remote terminal also we can control the system, if parameter value rises above set point. In real time we can monitor and control the system remotely with Zigbee transceiver module.

II. BLOCK DIAGRAM

Station 1

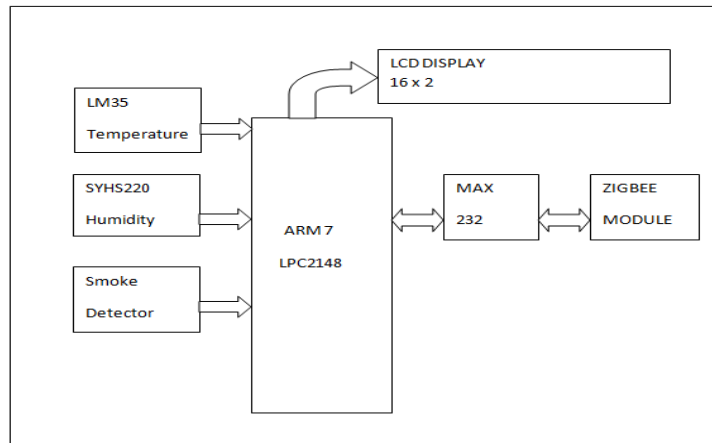


Fig 1. Block Diagram sensor station

Station 2

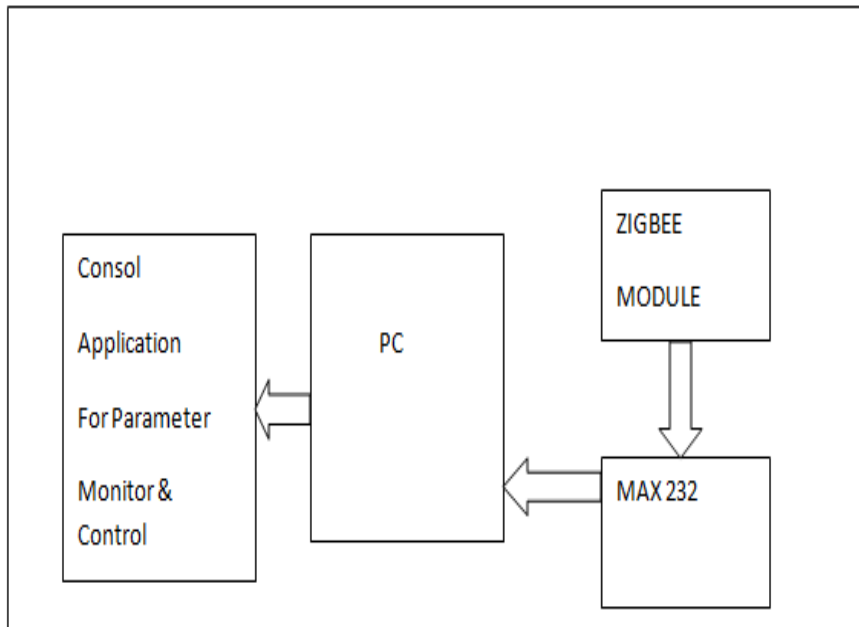


Fig 2. Block Diagram of remote station

Sensor station is formed with different sensors, display and Zigbee module.

- 1) LM35 - It is a temperature sensor used to measure the temperature.
- 2) SYHS220- It is humidity sensor used to measure the humidity in environment.
- 3) MQ7- It is smoke Detector used to sense the Smoke
- 4) LCD – used to display the parameter values
- 5) Max232- used to match the voltage level between Zigbee& ARM

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- 6) LPC2148- It is ARM 7 microcontroller it is main controller of the system which reads the sensor data & send the data on the LCD & UART.
- 7) Zigbee- Is the sensor node used to send the parameter to remote station & receive the control input from the remote station.

PC- It is remote monitoring and controlling station, PC used to display the measured parameter values on the console. If it increase beyond the set point then it is possible to control the parameter by sending some commands.

III. WORKING OF SYSTEM

As shown in block diagram all the sensors are connected to input terminals of ARM microcontroller. As per software program hardcoded into ARM, it scans all input terminals one by one. Value of sensed parameter display on LCD and same data is send to remote terminal. Channel no. 1 is connected to LM35 temperature sensor. Remote terminal is connected to Zigbee module. As communication between remote terminal and main control is bi directional from remote terminal controlling of temperature is possible.

Same way humidity sensor SYHS220 is connected to ARM. ARM controller scan the input terminal sense the humidity and display the parameter on display as well as remote terminal. Same way the smoke detector does. If smoke is present it displays 'Smoke Present' else display 'Smoke Absent'. One ZigBee module is connected with ARM microcontroller and second ZigBee module is connected at remote terminal. The sending & Receiving is done by connecting the pin of Zigbee with the pin of TXD & RXD pair of ARM Processor.

IV. IMPLEMENTATION

The system is designed using software and hardware. LPC2148, ARM controller is used as main control element. LM35, SYHS220 and MQ7 are sensors used to sense physical parameters temperature, humidity and smoke respectively.

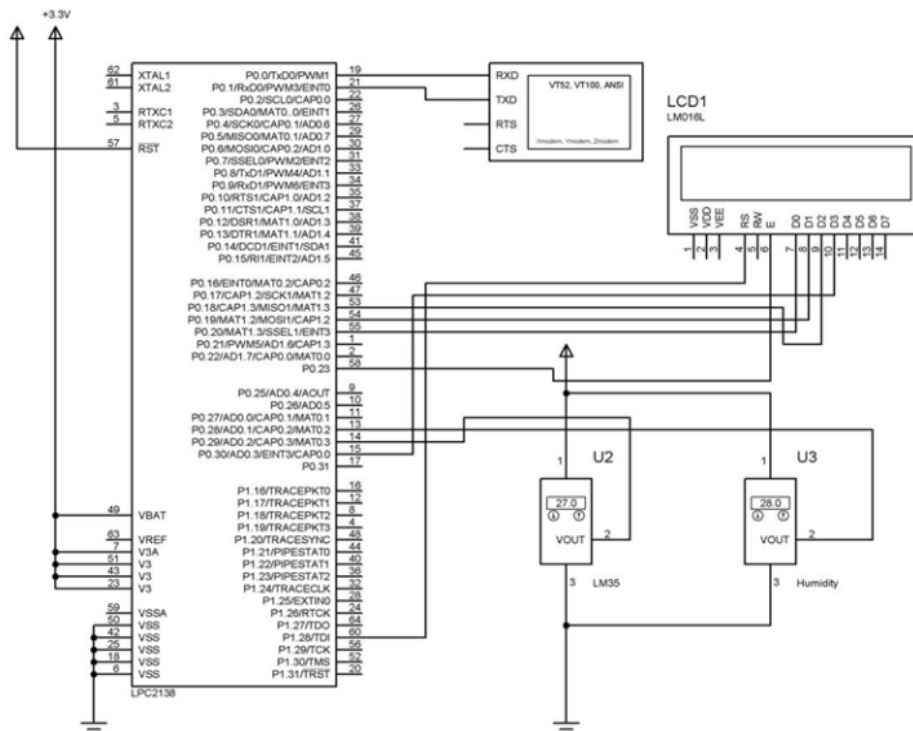


Fig3: Schematic of WSN System Design

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V. METHODOLOGY USED

Different network topology like Star, Mesh, and Ring can be use for WSN Sensor node communication. Mesh topology is used in this system design.

VI. ALGORITHM

- 1) Start
- 2) Initialize the Port pins for ADC, LCD & other peripherals
- 3) Initialize serial port for Zigbee with baud rate 9600
- 4) Scan 1st terminal & read temperature
- 5) Scan 2nd terminal & read humidity
- 6) Scan 3rd terminal & read Smoke status
- 7) Display all parameter values on LCD screen
- 8) Send all parameter values from Zigbee to remote station
- 9) Stop

v. FLOWCHART

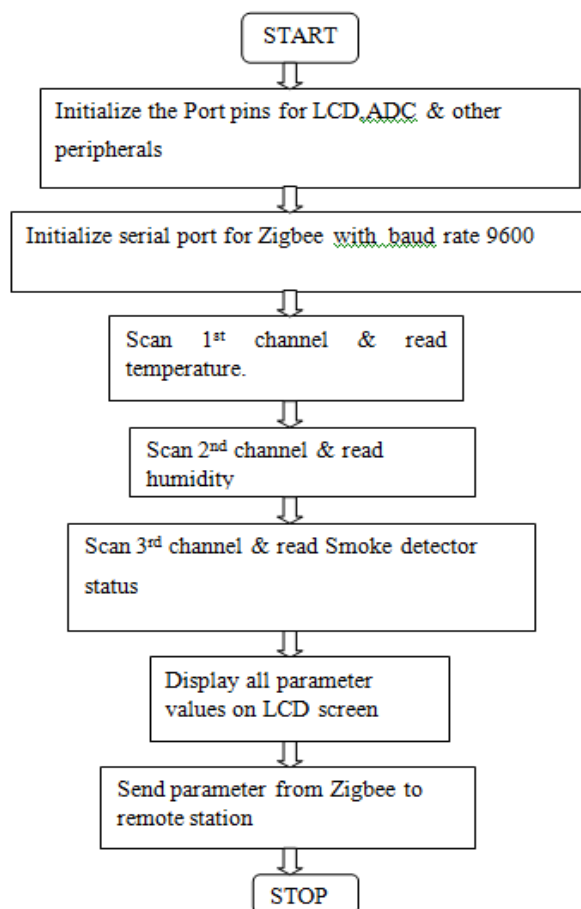


Fig4: Design flow of WSN

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VII. RESULT & CONCLUSION

- Result

WSN system design is done on ZigBee protocol IEEE802.15.4. ARM 7 microcontroller and three different sensors are used for the same. The peer to peer communication between the node and the computer is implemented. The data display on the LCD module & same data also send on the remote station using the Zigbee module. This system can be used in error free long distance communication, process industries, mining, chemical, bio-medical application.

- Conclusion

This system completely based on ARM7. In ARM7 has onboard serial port as well as 14 different ADC channels inbuilt with it. Used Zigbee module has the range of 300m, but the communication & data rate as good as other devices & it do not have any problem of Line of Sight. By using the pin of TXD & RXD it is possible to send the sensor data using the Zigbee Wireless Technology.

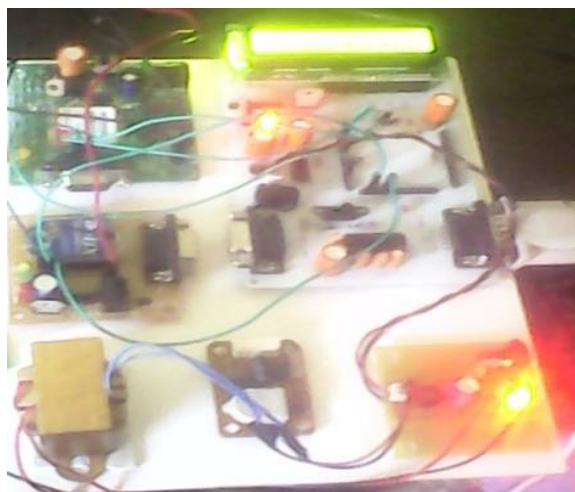


Fig 5. System Design Setup module

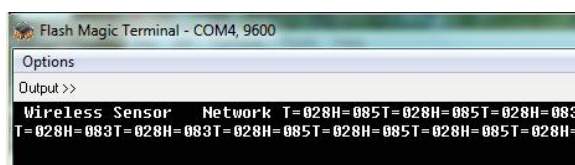


Figure 6: Remote data log on PC using Zigbee

The data logging using the Zigbee perform by connecting one Zigbee module with the ARM 7 LPC2148 & one module with PC. The log message is display on the Flash Magic terminal.

REFERENCES

- [1] MRajesh Singh and Shailesh Mishra, "Temperature monitoring in wireless Sensor Network using Zigbee Transceiver Module" IEEE Transactions on Industrial Electronics 978-1-4244-8542-0/10/2010
- [2] Magno, M.; Boyle, D.; Brunelli, D.; O'Flynn, B.; Popovici, E.; Benini, L. (2014). "Extended Wireless Monitoring Through Intelligent Hybrid Energy Supply". IEEE Transactions on Industrial Electronics 61 (4): 871. doi:10.1109/TIE.2013.2267694

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 10, October 2016

- [3] Y. Fan, Y. Yin, L. Xu, Y. Zeng, and F. Wu, "IoT based smart rehabilitation system," IEEE Trans. Ind. Informat., vol. 10, no. 2, pp. 1568–1577, 2014.
- [4] Ji Zhengzhou, Li Yan Lu Hu "The Implementation of wireless Sensor Network node Based on ZigBee" - IEEE Journals 978-1-4244-2018-4/08, 2008.
- [5] M. T. Lazarescu, "Design of a WSN platform for long-term environmental monitoring for IoT applications," IEEE J. Emerg. Sel. Topics Circuits Syst., vol. 3, no. 1, pp. 45–54, Mar. 2013.
- [6] Y. Chen and V. Dinavahi, "Multi-FPGA digital hardware design for detailed large-scale real-time electromagnetic transient simulation of power systems," IET Gener. Transmiss. Distrib., vol. 7, no. 5, pp. 451–463, 2013.
- [7] A. Salleh, M. K. Ismail, N. R. Mohamad, M. Z. A. Abd Aziz, M. A. Othman, M. H. Misran, "Development of Greenhouse Monitoring using Wireless Sensor Network through ZigBee Technology", International Journal of Engineering Science Invention ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726 www.ijesi.org Volume 2 Issue 7, July. 2013, PP.06-12.
- [8] A. Salleh1, M. K. Ismail, N. R. Mohamad, M. Z. A. Abd Aziz, M. A. Othman, M. H. Misran, " WIRELESS TEMPERATURE MONITORING SYSTEM USING WIRELESS SENSOR NETWORKS", International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 1, Issue 4, October 2012.
- [9] R. Ennaji and M. Boulmalf, "Routing in wireless sensor networks," Multimedia Computing and Systems, 2009. ICMCS '09. International Conference on, Ouarzazate, 2009, pp. 495-500. doi: 10.1109/MMCS.2009.5256646.