The Design of Tungsten Mine Environment Monitoring System Based on Wireless Sensor Networks

[#1]**Mattapally Srujana -M.Tech Pursuing,**
[#2]**Pradeep.Kalakoti–Assistant Professor,**
Department of ECE,
AURORA INSTITUTE OF TECHNOLOGY AND SCIENCES, WARANGAL, T.S.

Abstract--. The Zigbee Based Wireless Network for Industrial applications standardized nowadays. In this paper, we are implementing new design techniques for wireless industrial automation. The personal computer based wireless network for industrial application using Zigbee can be adopted at micro and macro Industries. This system has various types of Processors and Microcontrollers, further various sensors such as Temperature Sensors, LDR sensor, smoke sensor and Voltage regulators are used. The Personal Computer has full control over the entire system. The Personal computer is interconnected to all processor and controllers through Zigbee. The Personal Computer will continuously monitor and control all the data from remote processing unit. Here star topology three node Zigbee network is tried. The first Zigbee is connected to the personal computer it acts as full function devices and is used to send and receive data from other nodes. The second and third Zigbees are reduced function devices and they are used to control the speed of DC motor, temperature control ,lamp illumination control and smoke detection respectively. All the Zigbee's are interconnected with processing unit through RS232 protocol.

Keywords: Wireless Communication; Zigbee Network; Secured data transmission; D.C Motor Control; Closed loop temperature control; Illumination control.

I.INTRODUCTION

In the world today, everything would be incredibly different if it were not for wireless communication devices. The fact that we can communicate with people in other parts of our own country and the world is amazing and has led to lots of changes in human history. There are various kinds of wireless communication tools and here we will look at a few different kinds as well as the benefits of having them.

Short Distances

Sometimes wireless communication does not happen across thousands of miles but only across a few feet. For instance, if you have a television with a remote control, there is communication happening between the two. The remote control tells the television what to do and this information is transferred without the use of any wires.

You could also use walkie talkies for this purpose. These are little devices that work like telephones except with different methods and will allow two people or a group of people to talk to each other from a small distance away, such as at a festival or celebration.

Benefits of Short Distance Wireless Communication

Having these short distance devices allows many things to happen. You do not have to get up to change the channel, for one thing. With walkie talkies you are able to communicate with a group of people, which means that people who need to work together such as police men or fire fighters or security guards can do so at special events without having to take the time to dial a phone number. This can save time and sometimes lives.

Medium and Long Distances

Anything that can connect to the internet is capable of going through medium or long distances. Many forms of wireless communication such as cell phones and laptop computers can send information from ten feet to thousands of miles because they can connect to the internet. Wireless communication of this form has changed the world dramatically.

Now a days, wireless sensor networks are increasing in many areas including industrial data transfer and process control applications .In the case of Industrial Automation, data acquisition systems more than one receiver is a viable

model. The data broadcast algorithms for the 802.15.4 based Zigbee network standard and their applicability are examined .

The Unique characteristics of a wireless sensor networks are Limited power they can harvest or store, Ability to withstand harsh environmental conditions, Ability to cope with node failures, Mobility of nodes,

Dynamic network topology, Heterogeneity of nodes, Large scale of deployment, Node capacity is scalable.
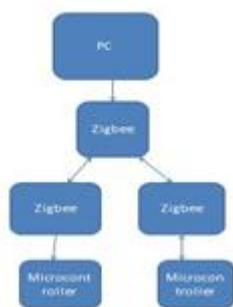

Figure 1 Block Diagram of Entire System

Here the data broadcast algorithms for the 802.15.4 based Zigbee network standard and their applicable are examined. Figure1 shown that three independent Zigbee trans receiver star network, One Zigbee is connected to personal computer which is used to receive and transmit data from the remaining two Zigbees. All Zigbees are communicating to external devices through serial port by using RS232 protocol[2] . User can control and monitor the entire network by using computer.

II.RELATED WORK

Wireless communication is the transfer of information between two or more points that are not connected by an electrical conductor. The distances involved may be short (a few meters as in television remote control) or long (thousands or millions of kilometers for radio communications).It encompasses various types of fixed, mobile and portable two-way radios, cellular telephones, personal digital assistants (PDAs), and wireless networking. Here we use the wireless network for industrial data communication.

A. Zigbee Protocol

ZigBee protocols are intended for embedded applications requiring low data rates and low power consumption. The resulting network will use very small amounts of power individual devices must have a battery life of at least two years to pass Zigbee certification. The applications that uses Zigbee protocol are building automation networks, home security systems, industrial control networks, patient monitoring, remote metering etc . Zigbee uses the IEEE 802.15.4 physical and MAC layers to provide standard-based, reliable wireless data transfer[3].
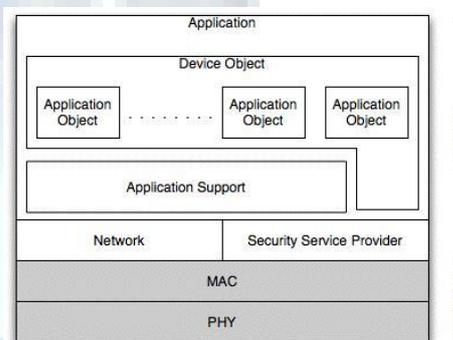

Figure 2 Zigbee Protocol Stack

B. Zigbee Protocol Features

1)Data rates of 250 kbps with 10-100 meter range. Power management to ensure low power consumption

2)16 channels in the 2.4GHz ISM band Low latency

3)Low duty cycle - Provides long battery life Up to 65,000 nodes on a network

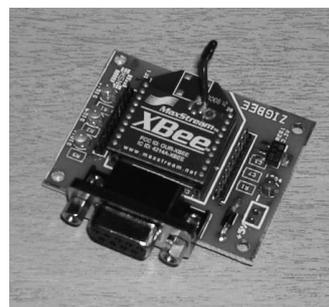4)Support for multiple network topologies: Static, dynamic, star and mesh

Figure 3 Photo Image of Zigbee Module

C. Collision Avoidance

Zigbee specifies a collision-avoidance algorithm similar to 802.11b, each device listens to the channel before transmitting in order to minimize the frequency of collisions between Zigbee devices. Zigbee does not change channels during heavy interference, instead it relies upon its low duty cycle and collision-avoidance algorithms to minimize data loss caused by collisions. If Zigbee uses a channel that overlaps a heavily used Wi-Fi channel up to 20% of all Zigbee packets will be retransmitted due to packet collisions.

.

III. HARDWARE PLATFORMS OVERVIEW

An evaluating hardware was developed with Max streem, Zigbee pro Zigbee module, it consumes only 2mW and 1.25 mW power at active and sleep mode. It is compatible to transfer data upto 400 Meter range at 250Kbps. Zigbee pro is very suitable to Mesh, point-to-point and point-to-multipoint networks. It can be interfaced to External devices like, microcontroller, sensors and etc. Zigbee pro manufacturer provide XTU software package to program the Zigbee module.

Here LPC2148microcontroller is used to process individual systems and personal computer is used in monitoring and control station[3]. Both of the microcontrollers and personal computer are interfaced with Zigbee module through UART port. ULN 2003 driver is used to control the speed, direction of DC motors and also it saves motor from high current and short circuits.

Figure 4 Photo Image of Working Model
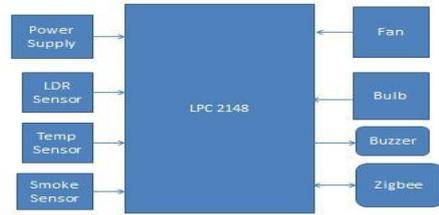
IV. INDUSTRIAL AUTOMATION AND CONTROL

Figure 5 NODE 1(SLAVE 1)-Transmits the status of control devices to PC(MASTER) through Zigbee

Here NODE 1 shows that Temperature sensor, LDR sensor, smoke sensor are connected to Microcontroller which sense the information of control devices and communicates to the personal computer through Zigbee transceiver. Here Special focus is made on secure communication between Personal Computer and NODE 1.
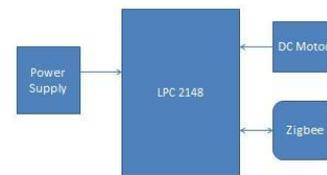

Figure 6 NODE 2(SLAVE 2)-Speed of DC Motor is controlled by PC(MASTER) through Zigbee

Node 2 shows that the DC motor is connected to Microcontroller where its speed and directions are controlled by Personal computer through Zigbee transceiver.

V.SYSTEM IMPLEMENTATIONS AND RESULTS

Figure 7 Monitoring And Control Section

In Implementation of system, as shown in Figure 7, the user

can vary the speed and direction of the DC motor at NODE 2 through the Zigbee transceiver and can monitor the entire system at NODE1.
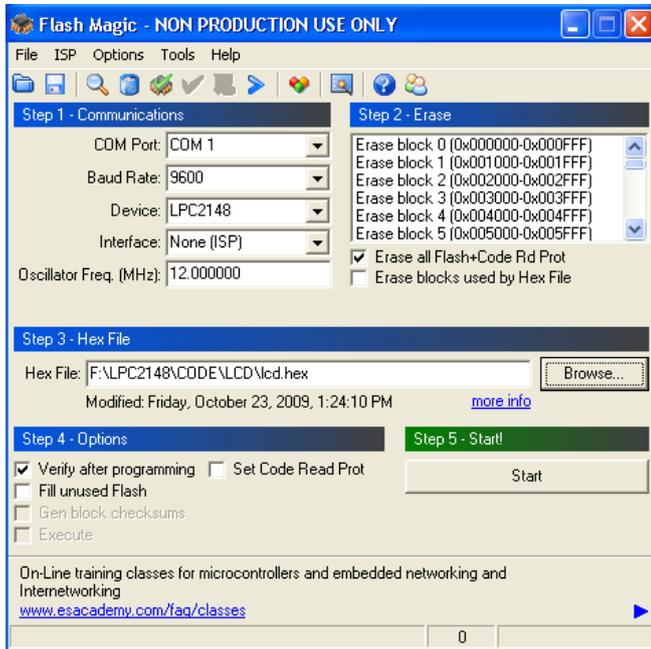

Fig 8. Flash Magic Page

The Zigbee which is at NODE1 transmits the information to the PC through Zigbee transceiver. These two processes will continue simultaneously without any disturbances. So the user can continuously control and monitor the data.

CONCLUSION AND FUTURE SCOPE

Industrial users should consider the type of monitoring and control applications that are suitable for LR-WPAN technology such as Zigbee. Reliability. Zigbee provides proper network topology, and it overcomes all problems in industries caused due to environmental issues[4]. We tested Zigbee networks in various environmental conditions by using three node star network for industrial applications. It was seen that error free proper communication was established between the processing unit and monitoring nit. In future we can also test other Zigbee networks for proper wireless data communication.

REFERENCES:

[1]Mainland G., Moulton S. and Welsh M., 2004, Sensor Networks for Emergency Response:challenges and Opportunities, In IEEE Pervasive Computing.

[2] Christopher E. Strangio "The RS232 Standard Tutorial" Downloaded from www.camiresearch.com Data_Com_Basics RS232_standard.html (Date 03/09/2009).

[3] NEW2AN and 1st Russian Conference on Smart Spaces, SMART 2008 St. Petersburg, Russia, September 3-5,2008.

[4] R. Hariprakash, Proc. of the Advanced International conf. on telecommunications, (AICT/ICIW2006).

[5] L.o'Gorman,"Comparing passwords, tokens, & Biometrics for the user authentication, proceedings of the IEEE,Dec 2003.

[6] D.maltoni, D.manio, A.K.Jain & S.prabhakar,Hand book of finger print recognition, sprinager 2003.

[7] Prabhakar,S., Wang, J., Jain,A.K., Pankanti, S., and Bolle, R.Minutiae verification & classification for finger print matching. In proc. 15th international conference pattern recognition (ICPR) (Sep-2000) vol.1, PP. 25-29.

[8] Abutaleb and Kamal(1999). Abutaleb A. S. and Kamal m., " A genetic algorithm for the estimation of ridges in finger prints", IEEE transaction On image processing, vol.8, no.8,p.1134,1999.