Data Acquisition and Control using ZIGBEE

Arshik Dhar, Hemin N. Dalal, Minesh J. Mistry

Abstract—**This system is developed to gather data of atmospheric condition in hazardous/remote areas where human intervention is a risk. Based on the study of the characteristics of ZigBee technology, and the analysis of the structure of wireless sensor networks, Proposes a new reliable, flexible and inexpensive WSN system based on the ZigBee technology. A temperature effect on devices, heavy machines and human life is a major concern for many in the industrial and domestic applications. In such applications monitoring temperature and controlling it through some external solutions are done. Also there is some application in which pressure, humidity and level monitoring and controlling is also important. In order to overcome these problems many industries and domestic users have been implementing many solutions. By our project we are demonstrating a cost effective and user friendly technique for acquisition and controlling of four basic atmospheric parameters using ZIGBEE..**

Index Terms—**ZIGBEE, Data Acquisition, Control.**

I. INTRODUCTION

The basic and essential parameters such as temperature, pressure, level and humidity readings must be monitored time by time for their efficient and safe operations in respective industries. Some of the industries have already coped up with the wireless techniques and some are still with the physical connections of wires to retrieve the data. The main problems with the physical connections for data acquisition are COST, SPACE and its MENDS or CARES. There will be more chances of loose or false connections. In addition to this, if we want the same data at more than one place then it will increase the above disadvantages. Owing to this, the wireless technique is more preferable than physical or electrical connections. In this way we noticed the industrial problem as, HOW CAN WE MONITOR THE BASIC QUANTITIES WITHOUT PHYSICAL CONNECTIONS......?

The NOURISHING answer to this question is DATA ACQUISITION SYSTEM using any WIRELESS TECHNIQUE. The numerous devices, modems and protocols for wireless communication are nominated in the market namely RF, IR, Bluetooth, Wi-Fi and Zigbee, etc. In all of its uses**,** we are going to use zigbee for our project, because it offers four inherent, beneficial characteristics:

1. Low cost
2. Range and obstruction issues avoidance
3. Multi-source products
4. Low power consumption

II. WHAT IS ZIGBEE?

ZigBee is a standard that defines a set of communication protocols for low-data-rate short-range wireless networking, Which has adopted IEEE 802.15.4 as its Physical Layer (PHY) and Medium Access Control (MAC) protocols. ZigBee-based wireless devices operate in 868 MHz, 915 MHz, and 2.4 GHz frequency bands. The maximum data rate is 250 K bits per second. ZigBee is targeted mainly for battery-powered applications where low data rate, low cost, and long battery life are main requirements. In many ZigBee applications, the total time the wireless device is engaged in any type of activity is very limited; the device spends most of its time in a power-saving mode, also known as sleep mode. Here fig.1 and fig.2 shows zigbee layered architecture and packet structure.
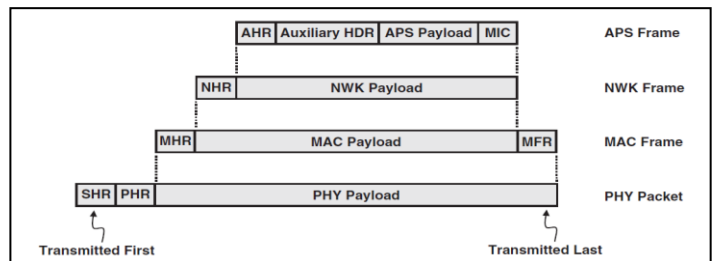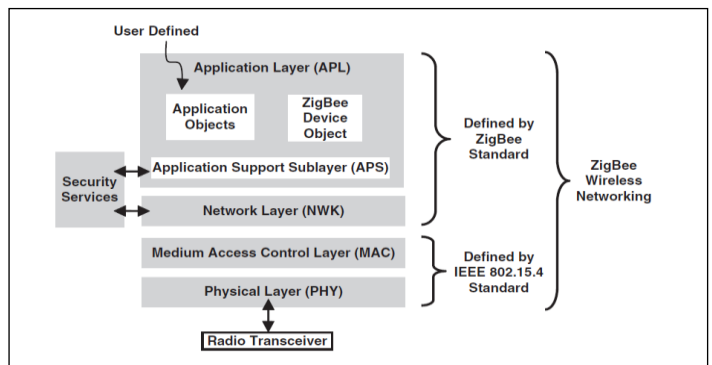

Fig. 1: Zigbee wireless networking protocols

Fig. 2: Zigbee Packet Structure

III. LITRATURE SURVEY

Table 2.1: Wireless Technology Comparison

	ZigBee	Wi-Fi	Bluetooth	UWB	Wireless USB	IR Wireless
Data Rate	20, 40, and 250 Kbps	11 & 54 Mbps	1 Mbps	100-500 Mbps	62.5 Kbps	20-40 Kbps, 115 Kbps, 4 & 16 Mbps
Range	10-100 meters	50-100 meters	10 meters	<10 meters	10 meters	<10 meters (line of sight)
Network Topology	Ad-hoc, peer to peer, star, or mesh	Point to hub	Ad-hoc, very small networks	Point to point	Point to point	Point to point
Operating Frequency	868 MHz (Europe) 900-928 MHz (NA), 2.4 GHz (worldwide)	2.4 and 5 GHz	2.4 GHz	3.1-10.6 GHz	2.4 GHz	800-900 nm
Complexity	Low	High	High	Medium	Low	Low
Power Consumption	Very low	High	Medium	Low	Low	Low
Security	128 AES plus application layer security		64 and 128 bit encryption			
Other Information	Devices can join existing n/w in 30ms	Device connection requires 3-5 seconds	Device connection requires up to 10s			
Typical Applications	Industrial control and monitoring, building automation	WLAN connectivity, Internet access	Wireless connection between devices e.g, phones	Streaming video	PC peripheral connect	Remote controls, PC, phone, laptop

III. WORKING STRATEGY

The invention discloses a ZigBee-protocol-based data acquisition and transmission method of a wireless sensor network. The wireless sensor network comprises a center node, a routing node and terminal nodes. The method is characterized by comprising the following steps that:
(1) a center node transmits management configuration information to other nodes in the wireless sensor network, and after receiving the management configuration information of the center node, the routing node and the terminal nodes perform node management configuration. After terminal node management configuration is finished, data acquisition is performed, and the acquired data are transmitted to other nodes through a ZigBee network;

(2) After the data transmission of the terminal nodes is finished, the terminal node enter a dormant state, relevant data are stored in a memory which is provided with an external power supply for continually supplying power, and a wakeup timer is started

IV. BRIEF ABOUT THE INVENTION

In this project we are demonstrating the working principle of zigbee and control the devices by continuously monitoring them. Here we continuously monitor the temperature, pressure, humidity and level and control them. One zigbee module is connected at the transmitter side and one is connected at the receiver side.
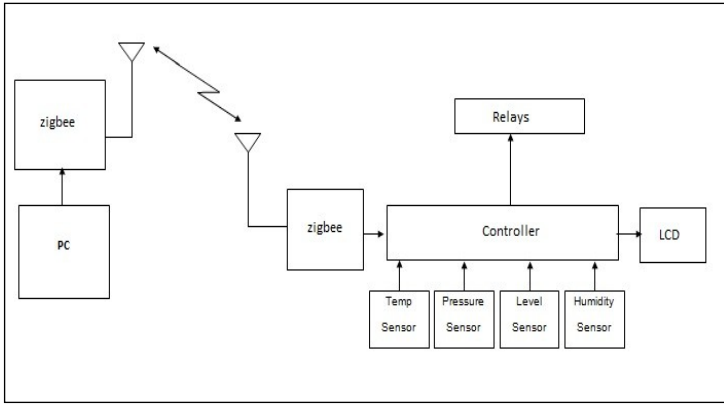
Fig 3: Block Diagram

There are four sensors.

1. Temperature Sensor

2. Level Sensor

3. Humidity Sensor

4. pressure Sensor

The block diagram of the transmitting section consists of four sections. The sensors, microcontroller, relays and the zigbee module & LCD. In the first section it contains the sensors. Then comes the micro controller section, relay section and finally the LCD and the zigbee module. It is the sensors that collect the parameters to be collected from the external environment. The data from the sensors is fed to the microcontroller. The analog inputs from the sensors are converted to digital values by the analog to digital converter. The processed signal is now given to the LCD module, which displays the data collected by the sensors. At the same time

the processed signal is transmitted to the zigbee module, from where the data get transmitted wirelessly to the receiver section.

The data which are transmitted from the transmitter side through the Zigbee module are received at the receiver circuit through another Zigbee module .The values thus collected are then send to the microcontroller through the UART module. Now the microcontroller will transmit it to the LCD and to the PC. In this project we are designing a monitoring and controlling unit which consists three sections for specific purposes. The first section of the unit consists of four sensors. For the example of temperature sensor, the section of the unit is designed using ADC0804 single channel.

A LM 35 Analog temperature sensor is used for temperature detection, which is connected to the input pin of the ADC 0804. The output pins of the ADC are connected to the microcontroller. The second section of the unit is designed using ULN 2803 high current drivers and SPDT relays for controlling the devices connected across them. The input pins of the ULN 2803 IC are connected to the microcontroller. The output pins of the ULN 2803 are connected to the Relays for controlling the AC devices connected to the Relays.

The third section is the microcontroller section with ZIG-BEE module interface. The ZigBee module is connected to the RX, TX pins of the microcontroller through Max 232. Here the reading is continuously transmitted to server through the ZigBee module. The unit can generate alert messages for different temperature values which are pre-determined low and high cut-off values. The server will transmit control commands to the unit.
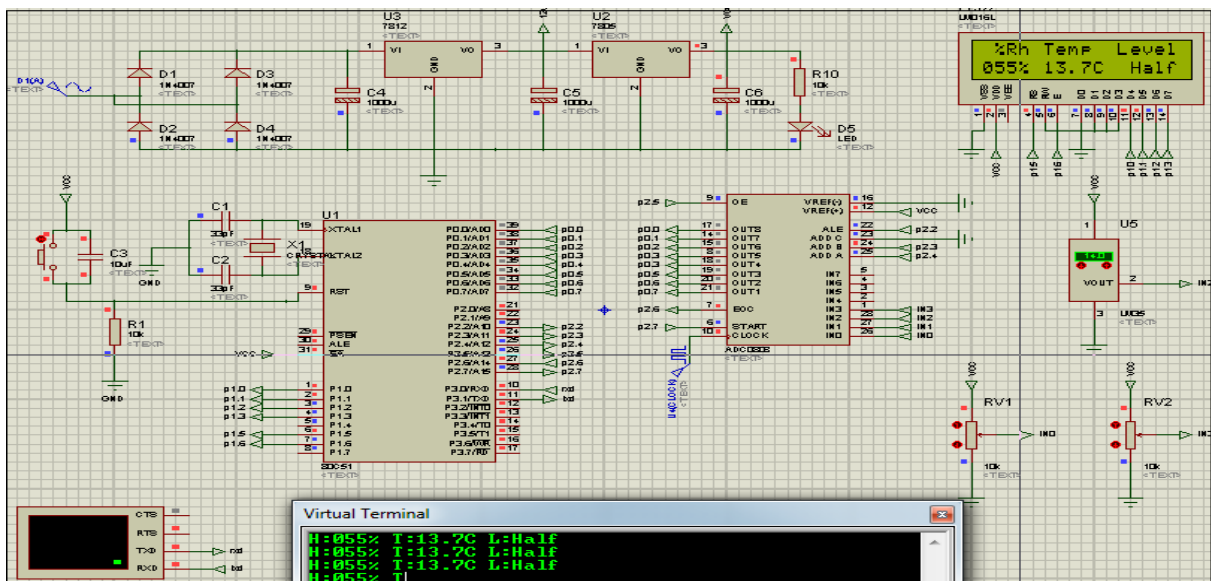
V. EXPERIMENTAL DETAIL & RESULT
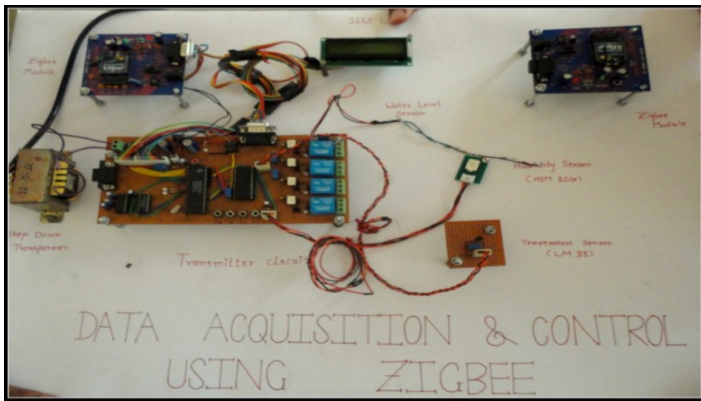

Fig 4: software window.

Fig 5: Hardware setup.

VI. SUMMARY OF INVENTION

The invention is applied based on the ZigBee protocol for wireless sensor networks low-power applications. The present invention proposes specifically for outdoor temperature, humidity, water level etc data collection to monitor the application of wireless sensor network data acquisition and transmission methods. wireless sensor network nodes use battery power. Therefore, this type of wireless sensor network applications have strict requirements for power control. to ensure the normal operation of the network transmission based on the maximum degree of reduction of power system operation. With inch for wireless sensor network data collection work characteristics, the agreement also used the synchronous cycle working mechanism, the program allows each terminal nodes synchronized wake and sleep cycles, data acquisition and transmission tasks are completed in a timely manner to sleep state, into ー steps to reduce the average power

VII. LIMITATION OF EXISTING TECHNOLOGY

Existing technical monitoring cycle is long, labor-intensive, does not reflect the dynamic changes of the water, humidity & temperature environment ,the high cost of the system as well as the ecological environment of water damage.

VIII. KEY LEARNING POINTS

Wireless sensor networks (Wireless Sensor Networks, WSNs) as an emerging technology that is deployed in the area to monitor a large number of cheap micro-nodes through wireless communication to form a multihop ad hoc networks, collaboration to collect and process monitoring area of sensing object information, and send the viewer. Its appearance created a new information in acquisition and processing mode, a combination of different types of sensors for environmental monitoring, And for data transmission & reception the use of ZigBee technology offers a advantageous approach.

IX. CONCLUSION

The project **Data Acquisition and control using Zigbee** has been successfully designed and tested. The projectis a very useful and convincing project that can be implemented in the areas where human life is at risk. The project can be elaborated by the use of high ranging modules that can transmit and receive worth low of cost. Thus the project can be a great boon to the scientific and environmental unplugged areas..

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Arshik Dhar-B.E. Student: Department Of Electronics Engg. B.V.M Engg . College, V.V Nagar, Gujarat, India. His areas of interest is Digital Signal Processing, Data Communication and Computer Networking.
Hemin N. Dalal- B.E. Student: Department Of Electronics Engg. B.V.M Engg . College, V.V Nagar, Gujarat,India. His areas of interest is Communication and Embedded Systems.
Minesh J. Mistry- B.E. Student: Department Of Electronics Engg. B.V.M Engg . College, V.V Nagar, Gujarat, India. His areas of interest is Microcontrollers and Embedded systems.