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Review Article

# Wireless Communications Enlargement: A Review of Advancement in Technologies

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***Abstract***

*This review paper is intended to serve as a summary review of the collective experience; the structural engineering community has gained from the use of wireless sensors and sensor networks for monitoring physical parameter. A benefit of wireless structural monitoring systems is that they are inexpensive to install because extensive wiring is no longer required between sensors and the data acquisition system.The characteristics of various sensors for monitoring applications have been studied. The requirements of the sensor for making a smart sensor network have been investigated and found out that, ZigBee is most efficient as compared to all others and in all aspects discussed in paper*

***Keywords:*** *Wireless sensor network, Radio frequency communication, Bluetooth, ZigBee, Applications.*

## 1. Introduction

Wireless technologies are under rapid development during modern years. Types of wireless technologies being established from simple Infrared data association that uses infrared light for short-range, point-to-point communications, to wireless personal area network (WPAN) for short range, point-to multi-point communications, such as ZigBee and Bluetooth , to mid-range, to long-distance cellular phone systems, such as CDMA and GSM/GPRS.

Wireless Sensors Network (WSN) is showing wide spectrum of applications in various sectors [Kim et al., 2007]. Majority of applications lies in information sensing, real time tracking, observing various physical parameters of industrial, environmental, health and automobile sectors. These technologies also benefit to record meteorological parameters [Ning Xu, 2004]. Compared to traditional temperature sensors, such as platinum resistors, thermocouples integrated temperature sensors have the advantage of signal conditioning and interface electronics can be integrated on the sensor chip. In this case the output signal can be transmitted using an antenna realized directly on chip, eliminating the need for external transmission lines and sophisticated packaging, which can reduce the power consumption of the system [ Eswawan, & Ahmad, 2005]. From the studies, it has been proved to be an alternative way to replace the conventional method that uses man power to monitor the environment [Zito et al., 2010] it is also proven that these approaches can improve the system performance.

The development of microelectronics, micromechanics, integrated optics and other related technologies has enabled us to develop various kinds of wireless sensors, which enable us to measure data more efficiently and precisely [Patil et al., 2012]. Efficiency relates to the speed of measurement. Thus many researchers investigated the Wireless Sensor Network and reported its suitability for securing and control the data [Othmana & Shazalib, 2012] [Jackson, 2008]. On extensive study of characteristics of ZigBee, it is found that ZigBee technology is mostly reliable and appropriate for indoor as well as outdoor sensor network. It delivers a transmission speed typically 250 kbps over a range of 100 m and can be configured in star, mesh or peer-to-peer topologies on literature survey; it is found that the reports on development of WSN for high-tech sensing applications are rather rare. Therefore, the development of Wireless Sensor Network, based on various technologies are studied and results of the design as well as implementation are reported in this review.

## 2. Wireless Sensor Network

A wireless sensor network is a system combination of radio frequency (RF) transceivers, microcontrollers, sensors and power supply source. Wireless sensor networks with self-configuring, self-organizing, self-diagnosing and self-healing capabilities have been developed to omit problems or to enable applications that traditional technologies could not fix [Cardei & Jie, 2006]. Wireless Sensor networks (WSNs) are the technology that could provide ubiquitous computing [Healy et al., 2007]. WSNs are the combination of embedded system and wireless communication which permits data transmission between the sensor nodes over ad-hoc wireless networks [Mitchell, 2007].

## 3. Sensor Characteristics

For selecting Sensor, the major properties must be considered are Static and Dynamic properties. The static

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characteristics of Sensor are defined as the way Sensor affects the measurement performance due to its inherent features. The static characteristics of a Sensor are its accuracy, error bands, span and zero, resolution of measurement, sensitivity (gain), repeatability, bias and drift and linearity [Bertolotti et al., 2010].The dynamic characteristics of a sensor are defined as the capability to handle rapid changes in the input [Akyildiz et al., 2002].

## 4. Wireless Sensors Advantage

### *4.1 Energy Efficiency*

Sensor nodes are powered with batteries; therefore a wireless sensor network deployed for monitoring consumes energy very efficiently. The system possesses low cost, low power, wider coverage [Ladgaonkar & Pawar, 2011]. Usually the deployment area is very large and thousands of sensor nodes may be needed, and therefore replacing batteries may be too costly, impractical or even not possible [Poslad, 2009].

### *4.2 Reduced Wiring Communication*

Most people feel the strong impact of wireless technology mainly due to the strong growth of cell-phone market. It has been estimated that typical wiring cost in industrial installations is US$ 130–650 per meter and adopting wireless technology would eliminate 20–80% of this cost [Tilak et al., 2002]. For example Honeywell installed a wireless system to monitor steam traps and saved the company US$ 100,000–300,000 per year [Mukhopadhyay et al., 2008].

### *4.3 Reduced Labor Work*

Cost intensive wiring plans have become out dated. Labor-intensive cable installation costs will be dramatically reduced and there will be no more need for wiring maintenance tasks [Zhu et al., 2006]. In the case of monitoring large geographic area without labor has been reduced the payment cost [Sensors Magazine].

### *4.4 Security*

In industry where the work is under corrosive environment [Crossbow Technology Inc., 2004], high vibration or elements in constant motion can damage the cables. The systems are provided with warnings before the damage caused by meteorological disasters to ensure the line security [Jianga et al., 2012].

## 5. Types of Technique

### *5.1Wi Max*

It has a long transmission range (up to 50 km) at 75 Mbps rate per channel, but can also be used for last mile broadband communications. The interest on these lower bands is that the signals can easily penetrate non-metallic obstacles and most walls, enabling communications out of line of sight [EmreAslan et al., 2012].

### *5.2 Wi-Fi*

It is a very popular solution and the equipment costs are low, with a typical indoor range of 30 m or 90 m outdoor range [Vaughan-Nichols, 2004]. Wi-Fi networks use radio technologies IEEE 802.11x standard, which is a standard that uses the 2.4 GHz and 5 GHz bands, to transmit and receive the wireless data [Ong & Grimes, 2002]. Wi–Fi is useful in implementing ad-hoc wireless networks.

### *5.3 Bluetooth*

Bluetooth is an open standard for short-range, low power and low-cost digital radio wireless communication [Yang et al., 2011]. The most common implementations are lower power, which can be up to range of 1 m or10 m depending on the power class. Bluetooth devices require much less power than Wi-Fi, but the area covered and data rates are also much lower. The Bluetooth transceiver use unlicensed 2.4 GHz frequency band, with a nominal bandwidth of 1 MHz for each channel. It is use for the control and monitoring processes [Vaughan-Nichols, 2004; Rodrigue et al., 2010].

### *5.4 ZigBee*

ZigBee was conceived in 1998, standardized in 2003 and revised in 2006. ZigBee is a relatively new, wireless personal area network technology based on IEEE 802.15.4, with a transmission range of 100+ meters. It has advantage of low cost, low power and wider coverage [Rodrigue et al., 2010]. Additionally it complies with IEEE802.15.4 protocol, which makes it convenient to communicate with other Products that comply with the protocol too. ZigBee I/O Sampling that is Xbee module can read sampling values on its pin by itself also tends to decrease the cost of module [Zhu et al., 2006]. The main advantages of ZigBee are lower power consumption and network self-reconfiguration [Boonsawat., 2010].

### *5.5 RFID*

Radio Frequency Identification (RFID) is technology for a wireless transmission of device identification. They answer with a sequence of bits that defines its identification [Want, 2004]. RFID tags read the state of some attached sensor (temperature or a MEMS accelerator for instance) and have internal active power for instance, harvesting the energy from the environment [Mokhtar et al.,] their use in automation may largely exceed device identification. The advantages of RFID are management of data, response to temperature alert, ease and accuracy of required documentation.

### *5.6 UWB*

Ultra-wideband is a technology where the communication is send by short-pulse electromagnetic waves, instead of the modulation of sine wave carriers [Fontana, 2004]. It is claimed that UWB might achieve rates up to 500 Mbps in a 2m range operating in the same bands as other communication system without significant interference.

**Table 1** Comparison between Wi-Fi, Bluetooth, ZigBee, RF and GSM/CDMA

| S .No | Feature | Wi-Fi (IEEE 802 11B) | RF (ISO/IEC 14443-2) | Bluetooth (IEEE 802.15.1) | Zigbee (IEEE 802.15.4) | GSM/GPRS CDMA/1X RTT |
|---|---|---|---|---|---|---|
| 1 | Radio | DSSS# | FHSS | FHSS* | DSSS | - |
| 2 | Data Rate | 11 M bps | 150 kbps | 1 M bps | 250 kbps | 64-128+ |
| 3 | Nodes Per Master | 32 | 65 | 7 | 64000 | 1 |
| 4 | Slave Enumeration Latency | Up to 3s | Up to 3s | Up to 10s | 30 ms | - |
| 5 | Data Type | Video, audio, graphics pictures, file | Compatibility with print, digital and magnetic media | Audio, graphics, pics, files | Small data packet | Wide Area Voice And Data |
| 6 | Range(M) | 100 | 35 | 10 | 70 | 10+ |
| 7 | Extendibility | Roaming possible | Yes | No | Yes | Yes |
| | Batter Type | AAA battery power | Lithium-ion polymer | Li-ion battery pack | alkaline batteries | Nickel cadmium |
| 8 | Battery Life | Hours | 6 to 12 months | 1 Week | >1 year | 1.7 |
| 9 | Complexity | Complex | Simple | Very complex | Simple | Simple |
| 10 | Frequency | 2.4GHz | 3kHz-300 GHz | 2.4GHz | 850-930MHz | 1,710–1,785 MHz |
| 11 | Security | Authentication service set ID(SSID) | - | 64 bit,128 bit | 128 bit AES and application layer user defined | - |
| 12 | Operating Environment | +32ºF to +104ºF | 32° F to 122° F | 32° F to 122° F | 0 to 55°C (32 to 131°F) | - 30 °C ~ + 85 °C |
| 13 | Success metrics | Speed ,flexibility | Compatible | Compatible, easy to handle | Reliability , power ,cost | Reach, quality |

#DSSS,direct sequenced spread spectrum, *FHSS,frequency hopping spread spectrum.

*5.7 GSM 2G and 3G*

The telecommunication Global System for Mobile Communication (GSM) services are evolving and providing larger coverage and higher rates with General Packet Radio Services (GPRS) or Universal Mobile Telecommunications Service (UMTS) [Crowley et al., 2005].here systems are completely autonomous, eliminating the need for repeated manual checks. Practical issues arising from implementation of the system are identified and performance of the system during field trials is assessed in comparison with commercially available temperature loggers [Manjeshwar and Agrawal, 2002].

Table 1 compares the various wireless standards that are most suitable for wireless sensor network. Wi-Fi and Ethernet is helpful to realize the unified communication. The Wi-Fi system have high speed and flexibility but a complex system [Vaughan-Nichols, 2004]. The Bluetooth is having security for industry, home automation control and industrial telemetry remote control sector [Yang et al., 2011; Rodrigue et al., 2010]. The RF system is compatible for every system and having low cost the all type of data is transmitted through its [Want, 2004]. The GSM is simple and covers a wide area but the important drawback is the network problem of the GSM. The main inconvenience is that these technologies require an infrastructure of a service provider. The web-based interface allows configuration of the network and access to real-time and archived temperature data through any Internet-capable device [Crowley et al., 2005]. For ZigBee, IEEE standard at the PHY is the significant factor in determining the RF architecture and topology of ZigBee enabled transceivers. For these optimized short-range wireless solutions, the other key element above the Physical and MAC Layer is the Network/Security Layers for sensor and control integration. Band of 915 MHZ transmission rate for 40 KB/S is applicable to the United States 2.4 GHZ transmission rate for 250 KB/S universal because the three band physical layer is not the same, their respective channel bandwidth is also different respectively 0.6 MHZ, 2 MHZ and 5 MHZ. There was a 10 and 16 channel. Different band of spread spectrum and modulation mode have distinction. Owing to its low power consumption and simple networking configuration, ZigBee is considered the most promising for wireless sensors. The ZigBee technology uses hybrid star networks, which uses multiple master nodes with routing capabilities to connect slave nodes, which have no routing capability .The consumption of the battery in various system is also describe in paper [Manjeshwar and Agrawal, 2002] & [Dousse et al., 2004]. It is also clear that, for a 20-min cycle time, the energy utilisation in SLEEP mode exceeds the ACTIVE mode energy by almost a factor of three and thus dominates the module energy utilisation thereby providing the ultimate limit to the lifetime of the energy source.Modulation mode with the phase modulation technology, but 868 MHZ and 915 MHZ band BPSK is used and 2.4 MHZ frequency band by OQPSK, ZigBee is a by many to 64000 wireless data transmission nodes consisting of a wireless digital network platform, in the whole network range, each ZigBee network digital module can communicate between each network node, the distance between this can from the standard 75 m infinite extension [Dousse et al., 2004]. ZigBee network is mainly for the industrial automation control data transmission and established, therefore it must be simple and easy to use, reliable the price is low characteristics.

**Table 2** various performance parameters of Wireless system

| S.No | Parameter | Performance | Reference |
|---|---|---|---|
| 1 | Energy Consumption | ZigBee node regarding the application data rate is low also they do not need to communicate, node can enter the very low power consumption state of hibernation, the energy consumption may only one over one thousand of the normal work condition. Because usually, resting time most of the total rum time, so to achieve high energy saving effect | Hossain et al., 2012 |
| 2 | Real Time Scale | Delay due to the random access ZigBee MAC layer and does not support time division multiplexing channel access and therefore cannot be very good support some real time business. | Wen-Tsai Sung, 2010 |
| 3 | Reliability, Accuracy | The physical layer using the spread spectrum technology to certain extent resist interference, MAC application layer have response retransmission function. The MAC layer CSMA mechanism envoy point before sending monitor channel can rise to avoid interference. | Tang et al., 2002 |
| 4 | Routing | ZigBee support the high reliability of the mesh network routings can be decorated wide range of network and support multicast and broadcast characteristics, will be able to give the rich application caused strong support | Gupta et al., 2007 |
| 5 | Networking | ZigBee bottom the direct expanding technology, if use the beacon mode the network can be extended heavily, because do not need to synchronous and node to join the network this process take a time of 1 second | |
| 6 | Suitability | data rate is low in the 2.4 GHZ only 250 KB/S, and it is just on the link rate, get rid of channel competition response and retransmission, etc the real consumption can be used by application of the rate may be less than 100 kb/s and the rest may be adjacent to multiple nodes and the same node of multiple applications carve up, therefore not suitable for video and so on things, suitable for application sensing and control | Vivoni et al., 2003 |

## 6. Performance Metrics of Wireless sensor network

We propose using the following metrics to evaluate sensor network protocols.

As sensor nodes are battery-operated, protocols must be Energy-efficient to maximize system lifetime [Tang et al., 2002]. System lifetime can be measured by generic parameters such as the time until half of the nodes die or by application-directed metrics, such as when the network stops providing the application with the desired information about the phenomena. [Wen-Tsai Sung, 2010] Observe that these protocols are observed to outperform existing protocols in terms of energy consumption and longevity of the network. We have taken the time varying nature of wireless channel into account in the optimization of energy management in a sensor network [Gupta et al., 2007].

The observer is interested in knowing about the phenomena within a given delay. The precise semantics of latency are application dependent. Obtaining accurate information is the primary objective of the observer, where accuracy is determined by the given application. In an example, system investigated and analyzed the effect of frame size and BER on network performance and throughput. From simulation results show significant improvement in the throughput of the proposed approach compared to the default protocol for high BER channels ($\geq 4 * 10-3$) [Tang et al., 2002]. This method involves partitioning frames such that errors can be isolated and corrected. Scalability for sensor networks is also a critical factor. For large-scale networks, it is likely that localizing interactions through hierarchy and aggregation will be critical for ensuring scalability.

## 7. Application of Wireless Sensors

Wireless sensors are being used in a vast number of fields which include, machine manufacturing, process automation, automotive, aerospace/military/homeland security, and specialty markets which includes Medical monitoring devices, engineering/architectural, R&D, wholesale/retail utilities [Ribeiro et al., 2003]. The availability of low-cost wireless sensing system for this type of application has a great potential to save human life especially elder people [Guo et al., 2002; Charles & Stenz, 2003].Sensor networks permit data gathering and computation to be deeply embedded in the physical environment. Sensor networks may consist of many different types of sensors such as seismic, low sampling rate magnetic, thermal, visual, infrared, and acoustic and radar, which are able to monitor a wide variety of ambient conditions that include the following: temperature, humidity, vehicular movement, lightning condition, pressure, Soil makeup, noise levels [Ribeiro et al., 2003].

### *7.1 Environment Monitoring*

In spite of the rapid development of computer technology, field measurements of environment variables, such as weather data and geo-referenced water quality data still depend on stationary sensors and data loggers, pencils and paper notebooks, which are labor-intensive and susceptible to recording errors during transcription. A wireless sensor system based on surface acoustic wave (SAW) technology has been developed to measure the temperature inside a refractory lining of a metallurgical vessel. The components of the sensor unit are designed for harsh environments to withstand moisture and high temperatures [Stentz et al., 2002].

### *7.2 Vehicle Guidance*

A WLAN-based, real-time, vehicle-to-vehicle data communication system was established. To exchange information between vehicles on vehicle states and operation control variables. Laboratory and field tests

**Table 3** Analysis of the Existing Wireless System for Physical Parameter Measurement

| Technology | Processor | Monitoring station | Tools | Programming code | Module interface | References |
|---|---|---|---|---|---|---|
| ZigBee | JN5121 | PC | Keil IDE | Java ,interactive C | RS232 | *Shen –Jin et al., 2007* |
| RF | PIC18F452 | PC | Valcon | Visual C net 2008 editor | Sony Ericsson | *Baerjii et al., 2010* |
| Fuzzy logic | STC12C5A32S2 | PC | Fuzzy Code | C/C++ | STC12C5608. STC12C5608 | *Bhutada et al., 2005* |
| GSM | MSP430F149 | PC | C430IDE | C | Siemens TC35 | *huang et al., 2011* |
| GPRS | C8051F310 | PC, Mobile | GPRS Module | Python | CC1020 | *Healy et al., 2011* |
| GSM-WSN | PIC16F74 (Dip configuration) | PC, Mobile | AVR STUDIO | C | LINX TXM & RXM-315-LR | *Hmed, 2011* |
| GSM | 8051 | PC | Keil IDE, LINUX OS | C,JAVA | NOKIA FBUS | *ahmed and ladhake, 2010* |
| Wi-Fi | ARM | PC, Mobile | Keil-IDE,LINUX OS | C51 | Siemens TC35,CC1100 | *Akyyildiz et al., 2002* |
| WSN | PIC16F877 | PC | IDE & MIKROC COMPILER | MikroC | LCD | *dursun & ozden, 2010* |
| PV system | MSP430 | Mobile | MATLAB and PSpice | C,Pythan | GM862QUA D-PY,CC2430 | *peijiang & xuehua, 2008* |
| GSM-WSN | 8051 | PC, Mobile | Keil IDE | C51 | Siemens TC35,CC1100 | *Xijun et al., 2009* |
| GSM, ZigBee | | PC, Mobile | Keil IDE | - | - | *K.Nimal kumar & R.Prapak* |
| Wireless GPS | AT89S52 | 7 segment display | Keil IDE | Assembly | - | *Chavez, 2009* |
| GSM | AT89S52 | Mobile | Keil IDE | Embedded C | Granular Matrix Sensor | *dursun and ozden 2011.* |
| GPRS, ZigBee | MSP430F2274 | PC | C430 IDE | C | Chipcon Cc2420 | *Adamchuk et al., 2004* |
| GPRS, ZigBee | 8051, Open Source Database | PC, Mobile | Keil IDE | Embedded C | - | *Anurag et al.,* |
| Bluetooth, RF Module | 8051 | PC, Mobile | Keil IDE | - | PIR Sensor 325 | *Sudharsan et al., 2011* |
| GSM, ZigBee CC2531 | ARM Controller | PC, Mobile | Keil IDE | - | Moisture Sensor | *Subhodip maulik, 2012* |
| GPRS, ZigBee | MSP430F2274 | PC | C430 IDE | C | - | *Kalra et al.,* |
| WSN | MSP430 | PDA | C430 IDE | C | - | *Ming et al., 2010* |
| WSN,GPRS Internet | MSP430F1611 | PC, Mobile | Tiny OS 2.1.0 google visualization api | C | - | *xiao & guo, 2011* |
| ZIGBEE | SPCO61A | PC, Smart Phone | Xilink Spartan 3 | C | - | *Jzan-sheng lin and chun- zu lin, 2008* |

demonstrated the feasibility of real-time, wireless data communications between vehicles in autonomous, master-slave vehicle guidance. [Chung et al., 2001] Implemented an autonomous tractor for spray operations in fields. During spraying, the tractor drove fully autonomously at least 90% of the time. This tractor could also be precisely controlled by a supervisor through a radio link. [Thysen, 2000] Developed an autonomous guidance tractor for spray operations in citric and olive trees fields in Spain. A user-friendly visualization agent was developed for human operators to remotely control and supervises unmanned tractors in a field through WLAN. [Sangani, K., 2004] Developed a wireless link between tractors and a human supervisor in a fleet of semi-autonomous tractors. Each tractor had the capability to detect people, animals and other vehicles in its predefined path and to stop before hitting such obstacles until it received control commands from a supervisor over a wireless link. A wireless personal safety radio device (WPSRD) was developed to avoid collisions between human and vehicle [Sahin et al., 2002].

*7.3 Traceability Systems (RFID)*

With an increasing demand for security and safety, complete documentations for food products, from field to customer, have become increasingly demanding [Sangani, K., 2004]. RFID has been accepted as a new technology for a well-structured traceability system on data collecting, and human, animal and product tracking [Sung & Hsu, 2011]. It has been projected that the applications of RFID will grow rapidly in the next 10 years with a compound annual revenue growth rate (2003–2010) of 32.2% [Valdastri et al., 2008].

## 8. A Review on Existing Temperature Monitoring System

All these systems given below in Table-1 are well suited for remote control and monitoring depending upon the requirements. Here PC, LCD and Mobile based technologies are explained. Bluetooth based solutions are also used for the purpose of the monitoring temperature and data transfer although Bluetooth eliminates the usage cost of the network to a great extent, its range of operation is limited to a few meters. One cannot remotely monitor and control devices using this technology. Also it is desirable for each home device to have a dedicated Bluetooth module but due to the fiscal expense of this type of implementation, a single module is shared by several devices which have a disadvantage of access delay.

**Table 4** Electrical configuration of various Batteries and Summary

| S.No | Type | Typical Lowest O/P Voltage, (V) | Typical Highest O/P Voltage (V) | Lowest Capacity | Highest Capacity, (Ah) | Summary |
|---|---|---|---|---|---|---|
| 1 | Alkaline | 1.5 | 15 | 18mAh | 27 | Cheap, widely available but usually can't be recharged, and can leak. Good for low drain devices. |
| 2 | Lithium | 1.5 | 9 | 2.2mAh | 35 | Powerful but can't be charged and small risk of explosion .NiMH or HD Alkaline is usually better. Great in smoke detector, ultra life band lasts up to 7 yrs. |
| 3 | Zinc carbon | 1.5 | 9 | 405mAh | 16.5 | Cheapest and least powerful. Good only for low drain devices like remote control. |
| 4 | Lithium rechargeable | 3 | 15 | 1mAh | 6.8 | Longest shelf life of any chargeable so it's good when batteries aren't replaced often. but capacity drops each cycle and prone to leaking |
| 5 | Nickel cadmium | 1.2 | 24 | 1.25mAh | 4.5 | Good for devices which benefit from extra voltages, but high voltage could burn out lights and fry electronics, also having short life cycle. |
| 6 | Nickel metal hydride | 1.2 | 24 | 12mAh | 10 | Good for most uses, except where you need long shelf life. |

**Table 5** Advantages of ZigBee technique

| S.No | Parameter | Advantage |
|---|---|---|
| 1 | Low Power Consumption | In the low electricity mode, it work up to 6-20 months, Bluetooth can work for weeks and Wi-Fi works for hours. |
| 2 | Low Cost | Through very simplified protocols and reduce the communication controller's request according to forecast analysis, with 8051 eight microcontroller estimates, the function of main node need to 32 kb code, sub function node less to 4 kb code. |
| 3 | Range | General transmission range is between 100 m, increase RF transmission power, can also increase up to 1-3 km. |
| 4 | Short Time Delay | ZigBee response faster, general from sleep to working state just 15 ms, joint connection between network only 30 ms, |
| 5 | Large Number Of Nodes | ZigBee can use star, flake and mesh network structure, by a master node management several child node. At the same time the master node can be from a layer of network node management, most can form 64000 node net |
| 6 | Security | ZigBee provide level 3 safe mode including no security setting, the use of access control list(ACL) to prevent illegal access data and the advanced encryption standard(AES 128) symmetry password to agile determine its security properties |

Interference is also a problem when using this technology [Sudharsan et al., 2011].Examples of the GSM based system are [huang et al., 2011; Hmed, 2011; Ahmed and ladhake, 2010; Xijun et al., 2009; Nimal kumar & R.Prapak; Dursun and ozden 2011; Subhodip maulik, 2012].It can provide the real time data and information with the help of internet access but again if PC is used it's incur additional implementation cost and it also restricts the mobility of the user. The network of the particular station is also a case where the data have been disturbed.

The systems where both PC and Mobile act as monitoring and control unit are given in [Healy et al., 2011; Hmed, 2011; Akyyildiz et al., 2002; Xijun et al., 2009; K.Nimal kumar & R.Prapak; Anurag et al.,; Sudharsan et al., 2011; Subhodip maulik, 2012]PC acts as home monitoring station and mobile control everything remotely. Although these systems eliminates one of the drawback of real time monitoring using internet and WSN but again increased cost due to PC is again a drawback.

If circuit is using 8051 microcontroller, the Analog to digital converter(ADC) is unbuilt due to which the complexity increases, response is also slow and power consumption is less[ahmed and ladhake, 2010; Xijun et al., 2009; Anurag et al.,; Sudharsan et al., 2011].In prototype[Akyyildiz et al., 2002; Subhodip maulik, (2012)] the system is very accurate and efficient in all manner as the ARM 7 used but the only disadvantage is that this prototype is expensive. In Some system, the PWM is used in MCU system, the microcontroller is having 40 pins so if all pins are not used it increases the complexity of the circuit. Secondly, the power consumption is more.

PIC16LF872 is also having large EEPROM, also high time response but it is not user friendly and even too cost effective. From all above, various advantages of ZigBee is concluded as it is simpler and less expensive than other WPANs, such as Bluetooth or Wi-Fi. ZigBee networks are secured by 128 bit symmetric encryption keys. It also has Very low duty cycle allowing for very long battery life. Static and dynamic star and mesh networks, supporting more than 65,000 nodes, with low latency available. Direct Sequence Spread Spectrum allows devices to sleep without the requirement for close synchronization. Different band of spread spectrum and modulation mode have distinction. Although the use of direct spread spectrum (DSSS) way, but in the bit to code piece mapping mode has bigger difference. Modulation mode with the phase modulation technology, but 868 MHZ and 915 MHZ band BPSK is used and 2.4 MHZ frequency band by OQPSK, ZigBee is a highly reliable wireless digital network with arrange of about 100m. . Special hardware and software installation is required to control the devices. Also in case of power failure, it is difficult to monitor and control the status of devices unless you have a battery backup which is an additional cost.

Although a commercial success, lithium ion batteries are still the object of intense research mainly aimed to the characterization of improved electrode and electrolyte

material. The present status of lithium battery technology, then on its near future development and finally it examines important new direction aimed at achieving quantum jumps in energy and power content.

## Conclusions

This paper has reviewed different wireless sensors used for temperature monitoring. The monitoring system is based on the integration of different sensors which has the capability of transmitting the data via wireless communication. The data are collated by a central processor which saves all data for processing as well as future use. If the system detects any abnormal activity a warning or alarm message can be transmitted to the care-giver. The availability of low-cost wireless sensing system for this type of application has a great potential to save human life and damages from any temperature related accident. Other factors likely to include relative humidity, light, carbon dioxide, carbon monoxide, energy consumption (power), smoke, occupancy and flow rate. With the use of wireless technologies it is expected to reduce total costs of ownership and maintenance costs in new project automation approaches.

ZigBee best suited for periodic or intermittent data or a single signal transmission from a sensor or input device. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth or Wi-Fi. ZigBee networks are secured by 128 bit symmetric encryption keys. The use of ZigBee technique to transfer data from one point to other, this method increases the life of battery and the product. Using this technology it's possible to cover large fields of about 1 km square area (70 m). System operation has been demonstrated in a wide range of temperatures (0 to 55°C) and under real-world operating conditions (several months in hostile environments). It also has Very low duty cycle allowing for very long battery life. Static and dynamic star and mesh networks, supporting more than 65,000 nodes, with low latency available. Direct Sequence Spread Spectrum allows devices to sleep without the requirement for close synchronization.

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