Application of Sensor Component in Wireless Network's for Signal Processing with Geographical Information

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Abstract

Sensor are the electronic component deployed at the specific area ,for collecting the information about that area. That information consist of geographical information, weather ,information, Temperature ,earth situation & material information present inside the earth .various work is carried for the application Of sensor nodes in all these area for gathering the information. In this paper dealing with geographical sensing of sensors nodes & overcome's the transmition delay making the transmition of data much more reliable & quickly transmit. In this paper we are comparing the existing method used for energy consumption[1].

Keyword: signal processing component, Geographical Information System ,SINA,

1.INTRODUCTION

Remote Sensing:- Remote Sensing is the science and art of acquiring information (spectral, spatial, temporal) about material objects, area, or phenomenon, without coming into physical contact with the objects, or area, or phenomenon under investigation. Without direct contact, some means of transferring information through space must be utilized. In remote sensing, information transfer is accomplished by use of electromagnetic radiation (EMR).[2][3] EMR is a form of energy that reveals its presence by the observable effects it produces when it strikes the matter. EMR is considered to span the spectrum of wavelengths from 10-10 mm to cosmic rays up to 1010 mm, the broadcast wavelengths, which extend from0.30-15mm.

Type In respect to the type of Energy Resources: Passive Remote Sensing: Makes use of   sensors that detect the reflected or emitted   electro-magnetic radiation from natural, sources. Active remote Sensing: Makes use of sensors that detect reflected responses from objects that are irradiated from artificially-generated energy sources, such as radar.

 1.In respect to Wavelength Regions: Remote Sensing is classified into three type sin respect to the wavelength regions

1.Visible and Reflective Infrared Remote Sensing.
2.Thermal Infrared Remote Sensing.
3.Microwave Remote Sensing

Bands Used in Remote Sensing

 Emission of EMR (Electro-Magnetic Radiation) from gases is due to atoms and molecules in the gas. Atoms consist of a positively charged nucleus surrounded by orbiting electrons, which have discrete energy states[5]. Transition of electrons from one energy state to the other leads to emission of radiation at discrete wavelengths. The resulting spectrum is called line spectrum. Molecules possess rotational and vibrational energy states. Transition between which leads to emission of radiation in a band spectrum. The wavelengths, which are emitted by atoms/molecules, are also the ones, which are absorbed by them.

Emission from solids and liquids occurs when they are heated and results in a continuous spectrum. This is called thermal emission and it is an important source of EMR from the viewpoint of remote sensing.

The **Electro-Magnetic Radiation** (EMR), which is reflected or emitted from an object, is the usual source of Remote Sensing data. However, any medium, such as gravity or magnetic fields, can be used in remote sensing. Remote Sensing Technology makes use of the wide range Electro-Magnetic Spectrum (EMS) from a very short wave "Gamma Ray" to a very long 'RadioWave'. Wavelength regions of electro-magnetic radiation have different names ranging from Gamma ray, X-ray, Ultraviolet (UV), Visible light, Infrared (IR) to Radio Wave, in order from the shorter wavelengths[7][8].

The optical wavelength region, an important region for remote sensing applications, is further subdivided as follows:

Name	Wavelength (mm)
Optical wavelength	0.30-15.0
Reflective	0.38-3.00
1.PortionVisible	0.38-0.72
2.Near IR	0.72-1.30
3.Middle IR	1.30-3.00
Far IR (Thermal, Emissive)	7.00-15.0

Microwave region (1mm to 1m) is another portion of EM spectrum that is frequently used to gather valuable remote sensing information[11].

2. BACKGROUND AND LITERATURE REVIEW

Brief His the term "remote sensing," first used in the United States in the 1950s by Ms. Evelyn Pruitt of the U.S. Office of Naval Research, is now commonly used to describe the science and art of identifying, observing, and measuring an object without coming into direct contact with it. This process involves the detection and measurement of radiation of different wavelengths reflected or emitted from distant objects or materials, by which they may be identified and categorized by class/type, substance, and spatial distribution.

The technology of modern remote sensing began with the invention of the camera more than 150 years ago. Although the first, rather primitive photographs were taken as "stills" on the ground, the idea and practice of looking down at the Earth's surface emerged in the 1840s when pictures were taken from cameras secured to tethered balloons for purposes of topographic mapping. Perhaps the most novel platform at the end of the last century is the famed pigeon fleet that operated as a novelty in Europe. By the First World War, cameras mounted on airplanes provided aerial views of fairly large surface areas that proved invaluable in military reconnaissance. From then until the early 1960s, the aerial photograph remained the single standard tool for depicting the surface from a vertical or oblique perspective. Satellite remote sensing can be traced to the early days of the space age (both Russian and American programs) and a began as a dual approach to imaging surfaces using several ty of sensors from spacecraft. In 1946, V-2 rockets acquired from Germany after World War II were launched to high altitudes White Sands, New Mexico. These rockets, while never attaining orbit, contained automated still or movie cameras that, took pictures as the vehicle ascended. Then, with the emergence of t space program in the 1960s, Earth-orbiting cosmonauts and astronauts acted much like tourists by taking photos out the window of their spacecraft[12].

3. APPLICATIONS

The applications for WSNs are varied, typically involving some kind of monitoring, tracking, or controlling. In a typical application, a WSN is deployed in a region where it is meant to collect data through its sensor nodes.

Area monitoring Area monitoring is a common application of WSNs. In area monitoring, the WSN is deployed over a region where some phenomenon is to be monitored. For example, a large quantity of sensor nodes could be deployed over a battlefield to detect enemy intrusion[13].

When the sensors detect the event being monitored (heat, pressure, sound, light, electro-magnetic field, vibration, etc.), the event is reported to one of the base stations, which then takes appropriate action (e.g., send a message on the internet or to a satellite). Similarly, wireless sensor networks can use a range of sensors to detect the presence of vehicles ranging from motorcycles to train cars.
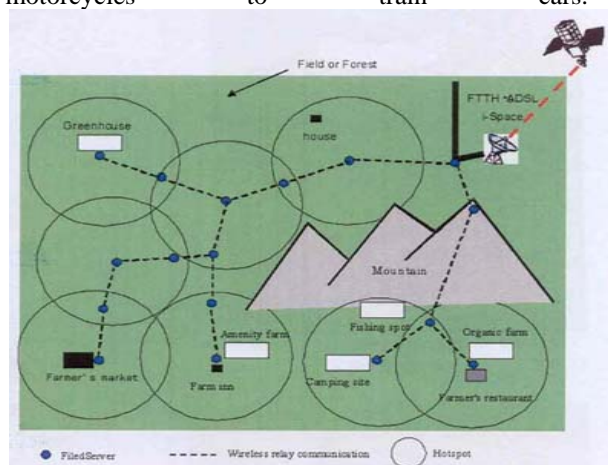

Figure1.Example of Area Monitoring

Environmental monitoring
A number of WSNs have been deployed for environmental monitoring[15].

Greenhouse monitoring
Wireless sensor networks are also used to control the temperature and humidity levels inside commercial greenhouses. When the temperature and humidity drops below specific levels, the greenhouse manager must be notified via e-mail or cell phone text message, or host systems can trigger misting systems, open vents, turn on fans, or control a wide variety of system responses.

Landslide detection
A landslide detection system, makes use of a wireless sensor network to detect the slight movements of soil and changes in various parameters that may occur before or during a landslide. And through the data gathered it may be possible to know the occurrence of landslides long before it actually happens.

Industrial monitoring Machine health monitoring
Wireless sensor networks have been developed for machinery condition-based maintenance (CBM)as they offer significant cost savings and enable new functionalities. In wired systems, the installation of enough sensors is often limited by the cost of wiring. Previously inaccessible locations, rotating machinery, hazardous or restricted areas, and mobile assets can now be reached with wireless sensors.

Water/Wastewater monitoring
There are many opportunities for using wireless sensor networks within the water/wastewater industries. Facilities not wired for power or data transmission can be monitored using industrial wireless I/O devices and sensors powered using solar panels or battery packs.

Landfill ground well level monitoring and pump counter
Wireless sensor networks can be used to measure and monitor the water levels within all ground wells in the landfill site and monitor leach ate accumulation and removal. A wireless device and submersible pressure transmitter monitors the leach ate level. The sensor

information is wirelessly transmitted to a central data logging system to store the level data, perform calculations, or notify personnel when a service vehicle is needed at a specific well.
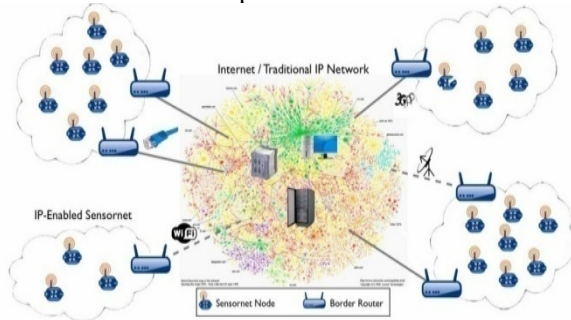

Figure2. Water/Wastewater monitoring

Agriculture

Using wireless sensor networks within the agricultural industry is increasingly common. Gravity feed water systems can be monitored using pressure transmitters to monitor water tank levels, pumps can be controlled using wireless I/O devices, and water use can be measured and wirelessly transmitted back to a central control center for billing. Irrigation automation enables more efficient water use and reduces waste[10]
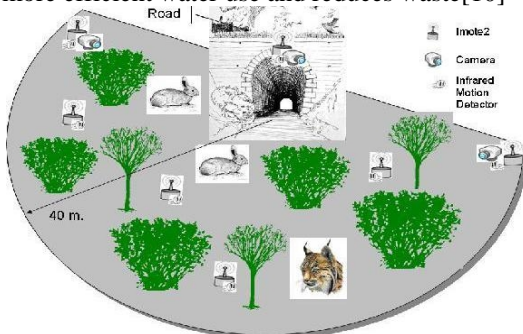

Figure3.Example of Agriculture

Fleet monitoring It is possible to put a mote with a module on-board of each vehicle of a fleet. The mote gathers its position via the GPS module, and reports its coordinates so that the location is tracked in real-time. The motes can be equipped with temperature sensors to avoid any disruption of the cold chain, helping to ensure the safety of food, pharmaceutical and chemical shipments. In situations where there is not reliable GPS coverage, like inside buildings, garages and tunnels, using information from GSM cells is an alternative for to GPS localization[12].

4. CHARACTERISTICS

Unique characteristics of a WSN include:
- Limited power they can harvest or store
- Ability to withstand harsh environmental conditions
- Ability to cope with node failures
- Coping with mobility of nodes
- Dynamic network topology
- Communication failures
- Heterogeneity of nodes
- Large scale of deployment

- Unattended operation
- Node capacity is scalable, only limited by bandwidth of gateway node.
-

Sensor nodes can be imagined as small computers, extremely basic in terms of their interfaces and their components. They usually consist of a *processing unit* with limited computational power and limited memory, *sensors* (including specific conditioning circuitry), a *communication device* (usually radio transceivers or alternatively optical), and a power source usually in the form of a battery. Other possible inclusions are energy harvesting modules, secondary ASICs, and possibly secondary communication devices (e.g. RS-232 or USB).

The base stations are one or more distinguished components of the WSN with much more computational, energy and communication resources. They act as a gateway between sensor nodes and the end user as they typically forward data from the WSN on to a server. Many techniques are used to connect to the outside world including mobile phone networks, satellite phones, radio modems, high power WiFi links etc.
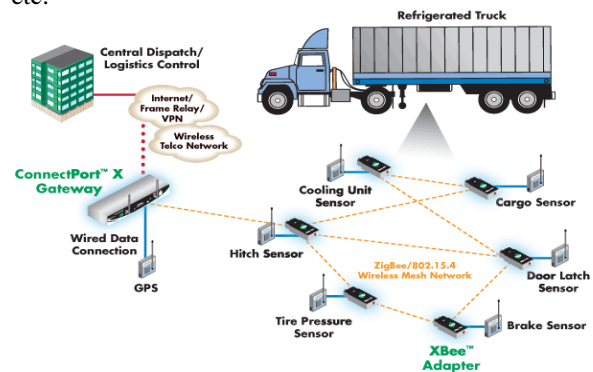

Figure 4.Example of WSN Network

5. HOME APPLICATION

Along with developing commercial application of sensor network it is no so hard to image that Home application will step into our normal life in the future. Many

Figure 5.Example of Home

application widows are also attached with vibratory sensors connected to police to against thief. How nice! You become nurse and bodyguard at the same time.

Platforms Standards and specifications

Several standards are currently either ratified or under development for wireless sensor networks. There are a

number of standardization bodies in the field of WSNs. The IEEE focuses on the physical and MAC layers; the Internet Engineering Task Force works on layers 3 and above. In addition to these, bodies such as the International Society of Automation provide vertical solutions, covering all protocol layer. Finally, there are also several non-standard, proprietary mechanisms and specifications[12].Standards are used far less in WSNs than in other computing systems. However predominant standards commonly used in WSN communications include:

- ISA100
- IEEE 1451
- ZigBee / 802.15.4
- IEEE 802.11

Hardware

Main article: sensor node

The main challenge in a WSN is to produce *low cost* and *tiny* sensor nodes. There are an increasing number of small companies producing WSN hardware and the commercial situation can be compared to home computing in the 1970s. Many of the nodes are still in the research and development stage, particularly their software. Also inherent to sensor network adoption is the use very low power method for data acquisition.
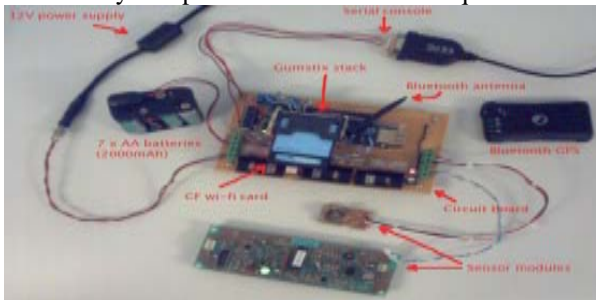

Figure 6.Sensor Network Component

SOFTWARE

Energy is the scarcest resource of WSN nodes, and it determines the lifetime of WSNs. WSNs are meant to be deployed in large numbers in various environments, including remote and hostile regions, with ad-hoc communications as key. For this reason, algorithms and protocols need to address the following issues:

- Lifetime maximization
- Robustness and fault tolerance
- Self-configuration
- Some of the important topics in WSN software research are:
- Operating systems
- Security
- Mobility
- Usability - human intereface for deployment and management, debugging and end-user control
- Middleware - the design of middle-level primitives between high level software and the systems

Operating systems

Operating systems for wireless sensor network nodes are typically less complex than general-purpose operating systems. They more strongly resemble embedded systems, for two reasons. First, wireless sensor networks are typically deployed with a particular application in mind, rather than as a general platform. Second, a need for low costs and low power leads most wireless sensor nodes to have low-power microcontrollers ensuring that mechanisms such as virtual memory either unnecessary or too expensive to implement[12].

It is therefore possible to use embedded operating systems such as eCos or uC/OS for sensor networks. However, such operating systems are often designed with real-time properties.

TinyOS[8] is perhaps the first[9] operating system specifically designed for wireless sensor networks. TinyOS is based on an event-driven programming model instead of multithreading. TinyOS programs are composed into *event handlers* and *tasks* with run to completion-semantics. When an external event occurs, such as an incoming data packet or a sensor reading, TinyOS signals the appropriate event handler to handle the event. Event handlers can post tasks that are scheduled by the TinyOS kernel some time later[11].

LiteOS is a newly developed OS for wireless sensor networks, which provides UNIX like abstraction and support for C programming language.
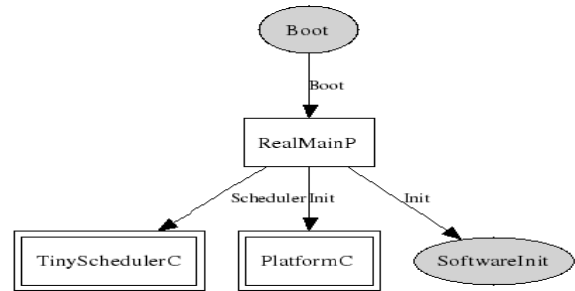

Figure 7.Tiny OS

Algorithms

WSNs are composed of a large number of sensor nodes, therefore, *distributed algorithms* are often targeted. WSNs are often energy-constrained, that is, energy is a scarce resource, and one of the most energy-expensive operations are data transmission and idle listening. For this reason, much algorithmic research in WSNs focuses on the study and design of *energy aware* algorithms for saving energy by reducing the amount of data being transmitted. To this end, techniques often employed are data aggregation, power cycling and the use of topology control algorithms.

Another characteristic to take into account is that due to the constrained radio transmission range and the polynomial growth in the energy-cost of radio transmission with respect to the transmission distance, it is very unlikely that every node will reach the base station, so data transmission is usually multi-hop (from node to node, towards the base stations).

The *algorithmic* approach to modeling, simulating and analyzing WSNs differentiates itself from the *protocol* approach by the fact that the idealized mathematical models used are more general and easier to analyze.

However, they are sometimes less realistic than the models used for protocol design, since an algorithmic approach often neglects timing issues, protocol overhead, the routing initiation phase and sometimes distributed implementation of the algorithms.

2. A sensor node contains an embedded microcontroller running an OS and the application program. The sensor input is conditioned and digitized. The transceiver establishes the communications link with the network. A power-management component makes the most of the limited battery power.
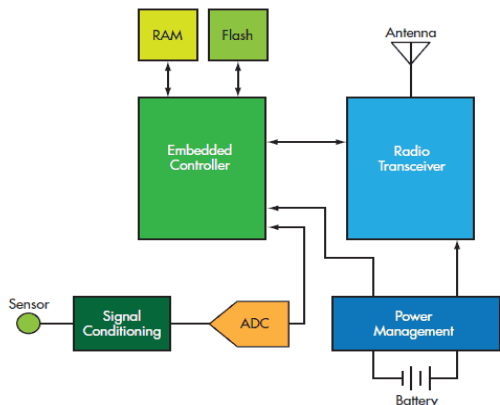

Figure 8.Algorithm Execution for WSN

Discussion of WSN simulators

There are network simulator platforms specifically designed to model and simulate Wireless Sensor Networks, like TOSSIM, which is a part of TinyOS and COOJA which is a part of Contiki. Traditional network simulators like ns-2 have also been used. Ns-3, which is an upgrade over Ns-2 is expected to be released shortly, also features WSN libraries[9][11] Network Simulators like QualNet, Opnet, NetSim and NS2 can be used to simulate Wireless Sensor Network. Other simulators, like IDEA1 -based on SystemC- have hardware-level libraries that permits system-level simulations by taking low-level constraints into account.Based on Matlab, the Prowler (Probabilistic Wireless Network Simulator) toolbox is available.

Distributed sensor network

If a centralised architecture is used in a sensor network and the central node fails, then the entire network will collapse, however the reliability of the sensor network can be increased by using distributed architecture.Distributed architecture is used in WSNs for the following reasons:

.Sensor nodes are prone to failure,

1.For better collection of data

2.To provide nodes with backup in case of failure of the central node

We also take care of nodes sensing redundant information and forwarding the data that is of no use. There is also no centralized body to allocate the resources and they have to be self organized.

Data visualization

The data gathered from wireless sensor networks is usually saved in the form of numerical data in a central base station. Additionally, the Open Geospatial Consortium (OGC) is specifying standards for interoperability interfaces and metadata encodings that enable real time integration of heterogeneous sensor

webs into the Internet, allowing any individual to monitor or control Wireless Sensor Networks through a Web Browser.

Information fusion

In wireless sensor networks, information fusion, also called data fusion, has been developed for processing sensor data by filtering, aggregating, and making inferences about the gathered data. Information fusion deals with the combination of multiple sources to obtain improved information: cheaper, greater quality or greater relevance[10]. Within the wireless sensor networks domain, simple aggregation techniques such as maximum, minimum, and average, have been developed for reducing the overall data traffic to save energy[3][5].

CONCLUSION

In this paper we are presenting the some of the major application where the sensor component are used in a effective manner and saving the time , and man power resource , these application's are costly but some very meaning full updation of implementation of electronics compound is done , this work is just a review of some of the well known application of sensor network,Some of the network simulator and previous work is also study in this paper

REFERENCES

1.Dargie, W. and Poellabauer, C., "Fundamentals of wireless sensor networks: theory and practice", John Wiley and Sons, 2010 ISBN 978-0-470-99765-9, p, 168-183, 191-192

2.Sohraby, K., Minoli, D., Znati, T. "Wireless sensor networks: technology, protocols, and applications, John Wiley and Sons", 2007 ISBN 978-0-471-74300-2, p. 203-209

3.Tiny OS website

4.TinyOS Programming, Philip Levis, Cambridge University Press, 2009

5.Eduardo F. Nakamura, Antonio A. F. Loureiro, Alejandro C. Frery. Information fusion for wireless sensor networks: Methods, models, and classifications, ACM Computing Surveys, Volume 39, Issue 3, Article 9, September 2007.

6.Eduardo F. Nakamura, Heitor S. Ramos, Leandro A. Villas, Horacio A.B.F. de Oliveira, Andre L.L. de Aquino, Antonio A.F. Loureiro. A reactive role assignment for data routing in event-based wireless sensor networks, Computer Networks Volume 53, Issue 12, pp 1980-1996, August 2009.

7. "21 ideas for the 21st century," Business Week, pp. 78-167, Aug.39, 1999.

8.http://en.wikipedia.org/wiki/Sens   or_Networks

9.Akyildiz, I.F.,W. Su, Y. Sankarasubramaniam, E. Cayirci, "A Survey on Sensor

10.Networks",IEEE Communications Magazine, August, 102-114(2002).

11.Chee-Yee Chong; Kumar, S.P., "Sensor networks: Evolution, opportunities, and challenges,"Proc IEEE, August 2003

12.Container and Truck Trailer Security

13.Brinckerhoff Quade and Douglas, Inc

14.http://www.sensornetworks.net.au/applic_health.html

15.Intel wireless vineyard, www.intel.com/technology/techresearch/research/ rs01031.htm.

16.J. Burrel, T. Brooke and R. Beckwith, "Vineyard Computing: Sensor Networks in Agriculture Production", Pervasive Computing, IEEE Volume 3, Issue 1, Jan.-March 2004 Page(s):38 - 45

17.Polly Huang, "Sensor Networks Solutions to Real Life Problems" http://cc.ee.ntu.edu.tw/ ~phuang .

18.I.A. Essa, Ubiquitous sensing for smart and aware environments, IEEE Personal Communications (Oct. 2000) 47 49