International Journal of Enhanced Research in Science Technology & Engineering, ISSN: 2319-7463
Vol. 3 Issue 2, February-2014, pp: (221-224), Impact Factor: 1.252, Available online at: www.erpublications.com

Sensor Network for Different Applications: Review

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Abstract: Sensor Network has its root from the past such as battlefield surveillance and due to progression of technology and its potential to be applicable to variety of fields make wireless sensor network a significant technology of 21st century. Wireless sensor networks (WSN) symbolize an up-and-coming set of technologies that will have intense effects across a range of medical, security, military and governmental applications [1]. Various applications of sensor network are surveyed that provides a novel approach that is more useful for the beginners. This paper defines critical assessment on applicability of wireless sensor network in variety of areas like traffic control, environment monitoring and surveillance, threat and fraud detection, health monitoring, security etc, that are to be researched further and they gives a particular type of knowledge based data i.e. more useful in research activities. This paper also focuses on some challenges confront by wireless sensor network like topology control, lack of node mobility, node failure, security breaching, and trespassing. This paper provides help to the beginners those who want to start research in sensor networks.

Keyword: Sensor Network, Sensor Node, Wireless Sensor Networks, Topology, Base Station. Sink Node.

1. Introduction

Currently wireless sensor network are used in the various applications of day to day life activities. A sensor network is a grouping of specialized transducers with ability of communication which helps to monitor and record conditions like humidity, pressure, vibrations, intensity of sound, level of pollution and concentration of chemicals etc. at different locations. A sensor network is a communication system which intends to record conditions and monitor at various locations. A sensor network have multiple detection station called sensor node. Each node is portable, less weighted and very small in size. Each node have inbuilt processing capability, signal processing and communication capability which processes the data collected by them. Main goal of wireless sensor network is to detect some results, event not just communicate sensed data. Wireless sensor network consist of base station (sink node) through which data collected from sensors is distributed across network. Data from different sensors nodes are collected, fused, processed and then transmitted to sink node. Sensors can be variety of types depending upon its application like audio sensor, video sensor, ultrasonic sensors etc. Basically through the outlier detection techniques faulty sensor networks are detected so that communication level is to be increased.

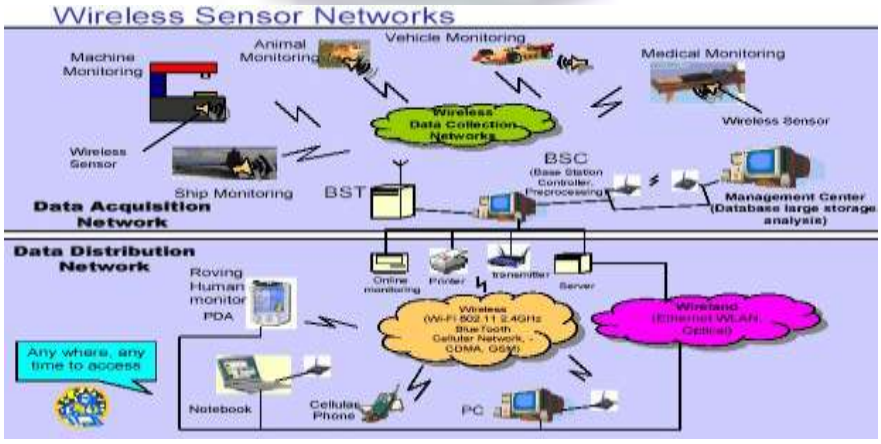

Fig 1: Showing Sensor Network

In development of sensor network lot of challenges comes in front like routing, topology control, information processing, security etc. Micro sensors are cheap, smart and portable devices and their networking is done through wireless links to sensor network.

2. Related Work

Recent Advances and Future Trends in WSN only includes the recent advances in wireless and electronic technologies have enabled a wide range of applications of WSN in military, traffic surveillance, environment monitoring, target tracking, healthcare monitoring and so on. This paper describes only limited application of WSN [2].

Research Issues in Wireless Sensor Network Application only overview of the research issues in WSN based application. This paper describes the introduction of Wireless Sensor Network. WSN are used in variety of fields. WSN, which is composed of several thousands of sensor nodes which are capable of sensing, actuating and relaying the collected information have made remarkable everywhere [4].

A Survey of Sensor Network Applications serves to explore the requirements, guidelines and constraints for general sensor network architecture design. This paper, present a snapshot of the recent deployed sensor network applications and identify the research challenges associated with such applications [5]. Research Challenge and Application for Underwater Sensor Networking summarized only ongoing research in underwater sensor network, including potential applications and research challenges. This paper highlighted potential application to off-shore oilfields for equipment monitoring, seismic monitoring, and underwater robotics [6].

A Survey of Wireless sensor Network Technologies including an overview of WSN, a survey of WSN technologies and discussion of existing research prototypes and only industry application. These study only highlights that middleware needs to provide a common interface for various functional components of WSN. In this paper, sensor network are used for industry field [7].

In this Paper Networks on Android Devices present a architecture to deploy lightweight semantic sensor network easily based on widely available android devices [8]. Wireless Multimedia Sensor Network Test beds intended to be a resource for researchers interested in advancing the state-of-the-art in experimental research on wireless multimedia sensor network [9]. List of Wireless Sensor Network Papers maintains a running bibliography of WSN papers that was initiated in 2007 and adjusts the list since that sensor used for Area Network [10].

3. Sensor Network Applications

Development of sensors and technological advancement rapidly accelerate applications of wireless sensor network in diverse areas.

Military application - Wireless sensor network gained its popularity through its deployment in military field. Wireless sensor network is used for detecting enemy position, movements for their security in case of war so as to get right information at right time. For example submarine surveillance in which acoustic sensors are fitted underground water so as to sense enemy submarines. A system of acoustic sensors (hydrophones) on the ocean bottom was deployed at strategic locations to detect and track quiet Soviet submarines [3].

Environmental applications - Wireless sensor network is used to perform daily routine activities like monitoring environmental factors such as humidity, temperature, pressure, noise level. Wireless sensor network also monitor habitat, climate for vegetation, sense and track movement of species of birds, animals. Also for sensing green house effects properly, sensor nodes are networked so that green house parameters at different locations are monitored for controlling condition. It can also monitor structural condition of ancient and historical buildings time to time so as to action to preserve our valuable assets from being get damaged (due to natural calamities).

Medical applications - Wireless sensor network is used to examine and control patient conditions. Any change in patient physical parameters like blood pressure, heart beat signals are detected by sensors and signals the doctor to pursue appropriate treatment, therapy etc. Advancement in technology makes home health care monitoring system possible for old persons. Also patients can be treated remotely through Wireless sensor network which helps in better understanding into origin of diseases and has helped in devising methods for rehabilitation, recovery and the impacts of drug therapy [4].

Traffic Monitoring applications - It is an appealing and potential application of Wireless sensor network as everyone in this busy life is in pace so to manage and control traffic conditions sensor nodes are deployed in car, aero plane etc. Such nodes detect vehicle location, distance which in turn help to cope up with accident problems. Air traffic is also controlled and monitored through sensor nodes. Sensors are deployed in such a way to monitor road intersection, heavy traffic jams. Information collected for such sensors are forwarded to traffic controller operator for taking proper actions. Wireless sensor network also helps in smart parking through efficient utilization of existing parking lot space inspire of investing in new parking space.

Event Detection Applications - Wireless sensor network is admired for its event detection ability like threat, fraud detection, fire detection.. All such types of detection is for strengthening security. For ex:-in many organizations, banks burglar alarms are used for security purpose by deploying sensors in them. But due to noise accuracy of sensed data cannot be guaranteed. Fuzzy logic techniques can be used in combination of sensor network to improve accuracy of result. Also in high alert areas where there are recurrent chances of attack, video sensors are deployed so to detect potential threats like vip buildings, information centre's etc. Sensing threat helps in preplanning. Now a day's sensors are used in public places also to sense possible threat. For ex-in shopping mall, theatres everyone is checked at entry point through an instrument embedded with sensors and counting of persons is also done at entry point. Such information helps in coping with undesirable situation.

Agricultural Applications - One of the most vital area of concern in agricultural field is to monitor climatologically conditions which straightforwardly affect crop productivity so it become necessary to monitor parameters like soil ph, type, moisture, humidity, temperature etc. So through controlling and monitoring, crop diseases can be minimized. Wireless sensor network make such things possible and farmers can take timely action to prevent their crop from damage. Wireless sensor network is used for increasing productivity by monitoring various aspects like soil quality, water scarcity etc. Data collected from deployed sensors are then used for planning how to increase productivity

4. Challenges Confronted in Sensor Network

Wireless sensor network going through a lot of challenges which must be set on in order to obtain precise results and to make wireless sensor network to be applicable to real life applications like cognitive sensing, spectrum management etc. So it's necessary to enhance existing technologies at a level which satisfies requirements imposed by real time applications. Resolving issues augment extent of wireless sensor network.

Network topological control and management - One of the demanding situations in wireless sensor network is to make it configurable. That is wireless sensor network must be able to self configure itself in order to cope with changing environment which arises need to modernize topology time to time. Such updation of topology arises as there is no preplanned connectivity in such adhoc network so as new algorithms comes in front sensor network must be updated. There must be provision to add or delete sensor node without halting wireless sensor network operation. Lot of algorithms exists for topological control but still researches are going through for development of a satisfiable algorithm.

Mobility Management - Since wireless sensor network is accelerating day by day and is being deployed in every field so it's a challenging task to handle node mobility. It has been researched that sensor node lacks mobility(static) so it's a research issue to study innovative mobility model as mobility can make sensor network work autonoumsly. Mobility can be intra sensor network or inter sensor network. Mobility means to move a node at new physical location when needed without breaking connectivity.

Interfacing and querying management - In wireless sensor network data is sensed and collected from the environment where nodes are deployed. Such collected data needs to be fused and then dispersed where desirable that is across the network or some else. So in sensor network database management is done. Therefore simple interface must be provided to users for getting or querying database so it's a challenging task to develop a technique which provide easy user interface for querying database rapidly.

Security Management - One of the most important challenge in wireless sensor network is to protect security of data collected by nodes because such information can be hacked by intruder by any way that is through trespassing or some else. Security concern need arise due to cruciality of collected information. Also another area of focus is privacy of deployed sensor so to hide location of sensor from attackers.

Conclusion

We conclude that critical analysis of applications of sensor networks will assist in further research approaches. A review of various applications of Wireless sensor network has been outlined in this paper. Various features of wireless sensor network like low cost, fast installation, flexibility make such application possible. It has been a great work for those who want to start the research on Wireless Networks and its domain. The entire work consist different phases and lots of theoretical concepts regarding the applications.. The above critical review will help in the further research. In future more advancing technology will develop smart and powerful sensors that make its application scope more broadly and in real life too.

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