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Study of Wireless Sensor Network and Its Current Trend in Application

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Abstract—This paper high light about the wireless sensor network and its recent trends in following application areas like Military, Environments, Healthcares and Industry.

Index Terms— Deploying, Monitoring, Nodes, Sensor.

I. INTRODUCTION

Wireless Sensor Network plays an important role in these days with the localization and tracking, sensor deployments in various distributions like environmental monitoring, battlefield awareness, infrastructure protection, context aware computing, and industrial sensing diagnostics. The sensors are unavoidable in many fields and the application of sensor networks are wide ranging and can vary significantly in application requirements:[11]

- Modes of deployment
- Sensing modality
- Power supply

II. OVERVIEW OF WIRELESS SENSOR NETWORK (WSN)

The Wireless Sensor Network is a collection of "nodes" called as sensors. There are several hundreds or even thousands, where each node is connected to one several sensors. A sensor network node has typically consists of following parts:

- Radio transceiver with an internal antenna or connection to an external antenna,
- Microcontroller, an electronic circuit for interfacing with the sensors and an energy source,
- Battery or an embedded form of energy harvesting

A sensor node might vary in sizes from shoe box sized to match box sized. The cost of sensor nodes is depending on the complexity of the individual sensor nodes. The cost and size constraints on sensor nodes result in corresponding constraints on resources such as:[11]

- Energy
- Memory,
- Computational speed
- Communications
- Band width.

Wireless sensor network topology can vary from a simple star network to an advanced multi-hop wireless mesh network. Fig 1. Shows the Sensor network and its research area applicability.

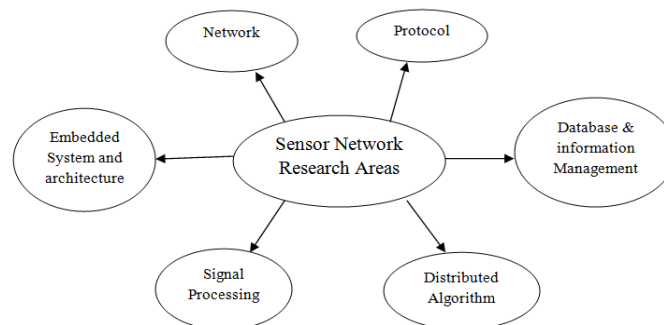


Fig 1: Interdisciplinary Research Area



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III. APPLICATION AREAS AND ITS TRENDS

A. Military

The Wireless Sensor Network has a great influence in the area of military surveillance by targeting and tracking the critical information from the hostile region and delivering the information to the base station at the right time [1]. It sends accurate information about the presence of people and the size of the vehicles. Its lifetime is estimated as years/decades. The performance of the sensor is estimated by its sampling rate and on-node data filtering. Its randomized distribution, self-alignment and fault tolerance nature makes it a promising approach for military application. In the battlefield the destruction of certain sensor in the dense deployment does not affect the sensor action because the deployed nodes are in the order of hundreds [6]. It is also used to obtain information about opposing force, battle destruction assessment nuclear and chemical possessions. A wireless sensor network known as Vigil Net which consist of 40,000 lines of code XSM and supports certain platforms that includes MICA2DOT and MICA2. The main objective of military surveillance system is to alert the personnel and it involves high degree of risk and stealthiness hence deploying unmanned surveillance system in the military has a great practical importance [4]

B. Environments

The Environmental wireless sensor network is placed in harsh environment with fault tolerance capability. A system called LUSTER- Light under Shrub Thicket for Environmental Research is used in environmental research [9]. In this technique it communicates using Lite Time Division Multiple Access a cluster based MAC protocol. The technique is provided with a delay tolerating network (DTN) to avoid data loss during the process of recovering at the back end. The sensor nodes provide non-volatile storage of data. The environmental sensor is used to measure various environmental factors such as landslides, volcanic eruption, flood detection, forest fire detection, cyclones, seismic waves, earthquakes, and tides [2]. The tremendous development of Wireless Sensor Network and its low cost implementation and maintenance made it worthwhile in environmental monitoring. It senses various environmental changes and reports accurately to the control unit. The sensor nodes can be deployed anywhere in the required geographical area [3]. The technique involved is based on event detection algorithm which transmits only the particular data that is changing vigorously. Cognitive sensor networks are used for obtaining localized information automatically and intelligently.

TABLE I: The various types of nodes used in environmental sensing are illustrated as follows:

Node Types	Orientation	Activity	Energy needed
Source	Random	Sensing and routing	constrained
Sink	Fixed	Collection	Not constrained
cluster	Fixed	Collecting and clustering	Not constrained

C. Healthcares

The wireless sensors used in healthcare applications provide quality of care with reduced cost. The technique adapted here is that the sensor is implanted in the patient's body for continuous monitoring. The quality of treatment can be considerably improved by continuous monitoring of physiological signals from the human body[7]. It is achieved with the reduced size and low power consumption of wireless sensor network. A sensor is attached to the patient body and it sends important information regarding heart beat, level of blood sugar and blood pressure to the base station through the nodes without disturbing other activities. If the health condition is critical then an alert can be generated to indicate the emergency situation. By receiving the data, immediate treatment can be given to the patient [8]. There are several ongoing projects for healthcare such as Code Blue which is used for monitoring and tracking of patients, Alarm Net which is used for residential monitoring and assisted living and GlucoWatch g2 a wearable WSN that will evaluate and monitor human vital signs. [5]Another type called Bio-medical wireless sensor BWSN used in home care and hospital for improved signal integration, security handling, and visualized



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D. Industries

The wireless sensor network is implemented in industry for monitoring and control heavy duty machines. The physical data such as vibration intensity, temperature, viscosity, flow and density are measured and transmitted for effective management and operation. In industry WSN provides several advantages in process monitoring and control over traditional wired system [4]. The wiring constraint is completely eliminated and the control signals are transmitted and received for activating the device. The wireless transmission system reduces the complexity of monitoring rotating equipments. For such applications the sensor is provided with high scalability, high fidelity and flexibility. So without tedious work the devices can be reorganized easily and also can be relocated whenever necessary. Since the device is wireless the maintenance problems such as burning of cables and corrosion can be completely eliminated [10]. The sensor can be installed at a reduced cost with the development of micro-electro-mechanical-system and it gives a better performance. Particularly by using Highway addressable remote transducer and Foundation Field bus provides a high data rate of 1.2 kbps and 31.25 kbps and a higher data transmission speed [3]. In industry WSN focuses on ultra low power consumption and reliable data throughput. Along with monitoring the efficiency of the motor is also evaluated. It is also used for flaw detection, smoke detection and leakage detection.

IV. CONCLUSION

This paper covers the wireless sensor networks and its current trends in application fields like military, environments, healthcares, and industry. It explains about the deployment of sensors, monitoring, and transmission in various fields.

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