Commentary
Volume 11:2, 2022

Telecommunications System & Management

ISSN: 2167-0919 **Open Access**

Wireless Sensor Network

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Description

Wireless Sensor Networks are self-configured, infrastructure-free wireless networks that monitor physical or environmental conditions such as temperature, sound, vibration, pressure, motion, or pollutants and cooperatively pass their data through the network to a central location or sink where the data can be observed and analysed. Users and the network are connected through a sink or base station. Injecting queries into the network and gathering results from the sink can be used to retrieve needed information. Hundreds of thousands of sensor nodes are typical in a wireless sensor network.

Radio signals allow the sensor nodes to communicate with one another. Sensing and computing devices, radio transceivers, and power components are all included in a wireless sensor node. Individual nodes in a Wireless Sensor Network (WSN) are resource constrained by design: processor speed, storage capacity, and communication bandwidth are all limited. After being deployed, the sensor nodes are responsible for self-organizing an adequate network infrastructure, which commonly includes multi-hop communication. The inbuilt sensors then begin collecting data of importance. Wireless sensor devices also respond to requests for specific instructions or sensing samples given from a "control site." The sensor nodes can operate in either a continuous or event-driven mode. To gather location and positioning information, the Global Positioning System (GPS) and local positioning algorithms can be employed. Actuators can be added to wireless sensor devices to allow them to "act" in response to particular situations. Wireless Sensor and Actuator Networks are a more specific term for these networks [1,2].

Due to many constraints, Wireless Sensor Networks (WSNs) offer novel applications and necessitate non-traditional protocol design paradigms. A appropriate balance between communication and signal/data processing capabilities must be discovered due to the demand for minimal device complexity along with low energy consumption (i.e. long network lifetime). Since the previous decade, this has motivated a massive effort in research, standardisation, and corporate investments in this subject. Currently, most WSN research is focused on developing energy- and computationally efficient algorithms and protocols, with the application domain limited to simple data-oriented monitoring and reporting applications. The Cable Mode Transition (CMT) method estimates the smallest number of active sensors required to ensure K-coverage and network connectivity. It allocates periods of idleness for cable sensors based solely on local information, without compromising the network's coverage and connectivity requirements. For wireless sensor networks, a delay-aware data gathering network structure is presented. The suggested network layout aims to reduce delays in data gathering operations in wireless sensor networks, hence extending the network's lifetime. To overcome the network geometric inadequacies, the authors examined relay nodes and used Particle Swarm Optimization (PSO) based techniques to find the ideal sink location with regard to those relay nodes [3,4].

Applications of wireless sensor network

- Due to their versatility in solving problems in several application domains, wireless sensor networks have grown in popularity and have the potential to impact our lives in a variety of ways. WSNs have been used successfully in a variety of applications.
- Military applications: Wireless sensor networks will almost certainly be a key component of military command, control, communications, computation, intelligence, battlefield surveillance, reconnaissance, and targeting systems.
- Sensor nodes are installed over a region where a phenomenon is to be tracked in area monitoring. When the sensors detect the monitored event (heat, pressure, etc.), one of the base stations receives a notification and takes appropriate action.
- Models of traffic congestion and traffic concerns are used to alert drivers.
- Supporting impaired interfaces, integrated patient monitoring, diagnostics, and drug delivery in hospitals, tele-monitoring of human physiological data, and tracking and monitoring doctors or patients inside a hospital are some of the health applications for sensor networks.
- Environmental sensing: The name Environmental Sensor Networks has come to encompass a wide range of WSN applications in earth science research. This encompasses volcanoes, oceans, glaciers, and forests, among other things. The following are some other important areas:

» Monitoring of air pollution

» Detection of forest fires

» Environmental monitoring

» Detection of landslides

Wireless sensors can be used to monitor the movement within buildings and infrastructure such as bridges, flyovers, embankments, tunnels, and other structures, allowing engineering firms to monitor assets remotely without the need for costly site visits.

Industrial surveillance: Wireless sensor networks have been developed for condition-based maintenance (CBM) in machinery because they offer significant cost reductions and new functionality. In wired systems, the cost of wiring sometimes limits the number of sensors that may be installed. In the agricultural industry, a wireless network relieves the farmer of the burden of maintaining wiring in a challenging environment. Irrigation automation allows for more effective water usage and waste reduction [5].

The deployment of sensor networks, which are a subset of wireless ad hoc networks, has numerous obstacles. Without any infrastructure, sensor nodes interact on wireless, lossy lines. Another issue is the sensor nodes' limited, frequently non-renewable energy supply. In order to maximise the network's lifetime, the protocols must be developed from the start with the goal of effective energy resource management. Wireless Sensor Network Design issues are discussed, as well as several platforms for WSN routing protocol modelling and testing.

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Received: 05 February 2022, Manuscript No. jtsm-22-64628; **Editor Assigned:** 07 February 2022, PreQC No. P-64628; **Reviewed:** 20 February, 2022, QC No. Q-64628; **Revised:** 25 February, 2022, Manuscript No. R-64628; **Published:** 02 March, 2022, DOI: 10.37421/2167-0919.2022.11.308.

Acknowledgement

None

Conflict of Interest

The author shows no conflict of interest towards.

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How to cite this article: Chauhan, Prakash. “Wireless Sensor Network.” *J Telecommun Syst Manage* 11(2022): 308