IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Vol.-6, Issue-9, Sept. 2018 E-ISSN: 2347-2693

Analysis on Wireless Sensor Networking Applications, Classification and Challenges Mechanisms

Jayakeerthi M.

AJK College of Arts and Science, Bharathiar University, Coimbatore, India

*Corresponding Author: sathyjaya@gmail.com

Available online at: www.ijcseonline.org

Accepted: 20/Sept/2018, Published: 30/Sept/2018

Abstract- Wireless sensor network is the emerging area where we are largely depending on it, in our day to day life. The major application of the wireless sensor network is the emergency navigation service during the emergency situations, and the main goal of this service is to save the people from emergency situations by guiding them to reach a safe with small congestion and fewer detours. Wireless Sensor Network will be the future of communication and it plays the vital rule of super internet in the future were all data are powered by wireless communication for transmission. This research paper discuss the techniques, key challenges and classification applications.

Keywords- Classification, Mechanism, Adaptive, Fault Tolerance.

I. Introduction

Recent advancement in electronics has enabled the development of low-cost, low-energy multifunctional miniature devices to be used in remote sensing applications. Such sensors can be extensively deployed for business, a civil and military package which includes surveillance, vehicle tracking, weather and habitat tracking intelligence, medical and acoustic statistics amassing. A WSN consists of large variety of sensor nodes which include sensing, records processing and conversation competencies[1]. Commonly sensor nodes are scattered within the sensing area. They coordinate amongst themselves to get records about the physical surroundings. The records are routed to the bottom station both directly or through other sensor nodes. The base station is both a set and cellular node that is capable to connect the sensor community to the internet in which user can get admission to and technique facts. The important thing in sensor networks is to maximize the life of sensor nodes due to the truth that it is not feasible to replace the batteries of thousands of sensor nodes[2]. Consequently, computational operations of nodes and communique protocols ought to be made as energy efficient as viable. Wi-fi sensor networks are doubtlessly one of the maximum important eras of this century. Brand new development in wireless communications and electronics has enabled the development of low-cost, low-electricity, multifunctional miniature devices to be used in far off sensing packages. The mixture of these factors have advanced the viability of the use of a sensor community which include a large variety of smart sensors, allowing the collection, processing evaluation and dissemination of valuable records accrued in a selection of environments. A sensor network consists of a large range of sensor nodes which include sensing, information processing and communication talents[3].

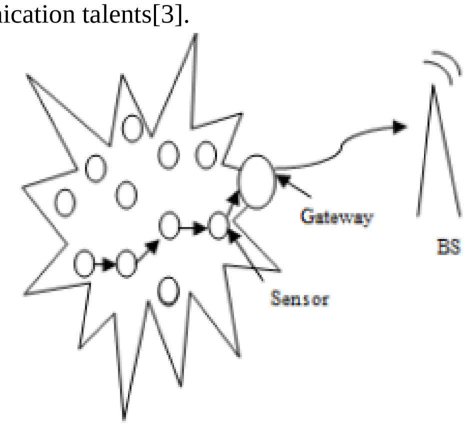

Figure 1: Wireless Sensor Network

A wireless sensor network is a network with a quite large number of nodes that have both processing and sensing capabilities. Of recent, this technology has emerged in terms of applications from transportation and logistics to smart grids and energy control systems as well as security and surveillance. In wireless sensor networks, nodes are deployed in a distant environment and normally data is collected from sources and transferred to a common node known as the sink. The presence of a sink node has an influential impact on the energy consumption and lifetime of WSNs. Wireless sensor networks had been crucial in different areas, however a number of issues raised and these include limited bandwidth, computing capacity, data delivery and severe energy constraints. Not only these but limited availability of energy within WSN, hence this has to be optimized. Additionally, it is still challenging to investigate the optimal arrival rate and balance the tradeoffs between arrival rate and blocking probability in wireless multimedia sensor networks.

II. Literature Survey

Das, t et al this paper proposing target tracking is one of the most popular applications of mobile wireless sensor networks (WSNs), where coverage and data gathering algorithms are foundations to achieve successful target tracking. Since the mobility of sensor nodes is of great importance in this particular class of application, it is crucial to design efficient techniques that can manage the mobility. In this paper, author particularly concentrates on military surveillance area where intruder tracking is one of the critical tasks. Many mobility models proposed so far in the literature are used to simulate and evaluate the performance of the networks. At times group mobility model is preferred over individual mobility model to simulate the nature of the application such as military surveillance, disaster relief, tactical environment etc. Usually, groups are formed at the time of sensor node deployment and become fixed. However, this is not appropriate for the application scenario under consideration. This motivates us to design a cooperative group mobility model (CGM) where groups of nodes are formed dynamically.

Zhou xin-lian et al proposing this paper presents one inner-cluster scheduling algorithm, avoiding mobile nodes' location affect, satisfying expected coverage scale and high-effect. This excludes the number of smallest inner-cluster active nodes k, which can satisfy expected coverage scale in monitored area, according to coverage analysis theory. In inner-cluster, only select k nodes with higher energy and nearer close to fixed node (should be avoided inner-cluster nodes leaving), others should be sleeping. Consequently realizes the schedule of higher energy nodes round sleeping. Simulation result display by this schedule, EDG (efficient data gathering) decreases data delay, and largely relieves the burden of cluster-head, and has apparent energy-saving effect, and thinks about node's mobility, can preferably suit to mobile wireless sensor network.

Gagneja, k. K et al proposed heterogeneous sensor networks are more powerful and efficient than homogeneous sensor networks. Homogeneous sensor networks perform poorly because of routine limits and scalability. In this research, author considers to use heterogeneous topology to securely route data in a wireless sensor network. The given area of interest is initially partitioned into voronoi clusters, where low-end nodes make clusters with high-end nodes. Each cluster has just one high-end node and a number of low-end nodes. Voronoi clusters are driven by the distance between the nodes, but purposed routing method the "improved tree routing" uses hop count to route the data in the network. However, voronoi clusters leave out some gaps in the topology.

Jambli, m.n. et al this paper proposing saving energy is a very critical issue in wireless sensor networks (WSNs) because sensor nodes have severe resource constraints such as lack of processing power and limited in power supply. Since the communication is the most energy consuming activities in WSNs, the power use for transmission or reception of packet should be managed properly. Transmission power control (TPC) technique is one of the techniques to reduce energy consumption which has been widely studied in mobile ad-hoc networks (MANETs). This technique is implemented by adjusting the transmission power in communication between nodes. However, as mobile wireless sensor networks (WSNs) applications emerge, the unique characteristics of this network such as severe resource constraints and frequent topology change suggest that TPC might be useful to reduce energy consumption in WSN.

III. Wireless Sensor Network Applications

3.1 Ecological Data Collection:

In natural information accumulation application, are utilized gather different sensor information as a part of a timeframe. If a data to be meaningful so collecting sensor data at regular interval and the nodes would remain at known locations. In the environmental data collection application, a large number of nodes continuously sensing and transmitting data back to a set of base stations that store data using traditional methods.

3.2. Military applications:

Most of the essential learning of sensor systems is fundamental on the resistance application toward the networks, particularly two vital projects the distributed sensor networks (DSN) and the sensor information technology form the defense advanced research project agency (DARPA), sensor systems are connected effectively in the military detecting. Presently remote sensor systems can be an indispensable piece of military charge, control, interchanges, registering, insight, observation, surveillance and focusing on frameworks.

3.3. Security monitoring:

In it the observing systems are gathered of hubs that are set at settled areas all through a situation that persistently screen one or more sensors to recognize an irregularity. A key distinction between security checking and natural observing is that security systems are not really gathering any information. This significantly affects the ideal system design. Every hub needs to as often as possible check the status of its sensors however it just needs to transmit an information report when there is a security infringement. The quick and solid correspondence of caution messages is the essential framework necessity. These are "report by exemption" systems. It is affirmed that every hub is still present and working.

3.4. Hub following situations:
In which remote sensor system is the following of a labeled article through a territory of space observed by a sensor system. There are numerous condition where one might want to track the area of critical resources or staff. Current stock control frameworks endeavor to track objects by recording the last checkpoint that an article went through. Notwithstanding, with these frameworks it is impractical to decide the present area of an article. For instance, ups tracks each shipment by examining it with a standardized identification at whatever point it goes through steering focuses. The framework separates when articles don't spill out of checkpoint to checkpoint. In ordinary workplaces it is illogical to anticipate that protests will be consistently gone through checkpoints.

3.5. Wellbeing applications sensor systems:
They are likewise generally utilized as a part of social insurance zone. In some present day healing facility sensor systems are built to screen understanding physiological information, to control the medication organization track and screen patients and specialists and inside a doctor's facility. In spring 2004 some clinic in taiwan even utilize rfid fundamental of above named applications to get the circumstance at direct. Long haul nursing home this application is spotlight on nursing of old individuals.

IV. Classification of WSN

(i) Terrestrial WSN: consist of large no. Of low-cost nodes deployed on land in given area usually in ad-hoc manner for applications like environmental sensing and monitoring, industrial monitoring and surface explorations etc.

(ii) Underground WSN: consist of no. Of sensor nodes deployed in caves or mines or underground to monitor underground conditions. They require appropriate equipments to ensure reliable communication through soil, rocks and water. Wireless communication is a challenge in such environment due to high attenuation and signal loss.

(iii) Underwater WSN: consist of sensors deployed underwater, like ocean environment. Underwater wireless communication uses acoustic waves that presents various challenges such as limited bandwidth, long propagation delay, high latency, and signal fading problems. Applications of underwater WSN include pollution monitoring, under-sea surveillance and exploration, disaster prevention and monitoring, seismic monitoring, equipment monitoring, and underwater robotics.

(iv) Multimedia WSN: consists of low cost sensor nodes equipped with cameras and microphones, deployed in a preplanned manner to guarantee coverage. Multimedia sensor devices are capable of storing, processing, and retrieving multimedia data such as video, audio and images. They must cope with various challenges such as high bandwidth demand, high energy consumption, quality of service (qos) provisioning, data processing, and compressing techniques, and cross-layer design.

(v) Mobile WSN: consist of mobile sensor nodes that can move around and interact with the physical environment. Mobile nodes can reposition and organize themselves in the network in addition to be able to sense, compute, and communicate. A dynamic routing algorithm must, thus, be employed unlike fixed routing in static WSN. Mobile WSNs face various challenges such as deployment, mobility management, localization with mobility, navigation and control of mobile nodes, maintaining adequate sensing coverage, minimizing energy consumption in locomotion, maintaining network connectivity, and data distribution.

V. Challenges Vs Required Mechanisms in WSN

Both WSN and Wireless ad-hoc networks have battery powered nodes and therefore there is a big common concern on minimizing power consumption. MANETS are usually “closed” to humans, that most nodes in the network are devices used by human beings e.g., laptop computers, PDAs, mobile radio terminals etc. On the other side, sensor networks do not focus on human interaction, but on the interaction with the environment. Due to this focus of wireless sensor networks on interacting with environment, the Network is embedded in environment. Nodes in the network are equipped to sense the physical parameters then process information and communicate wirelessly. The collaborative nature of WSNs brings several advantages over conventional wireless ad-hoc networks, including self-organization, rapid deployment, flexibility, and inherent intelligent-processing capability. However, the unique features of WSN present new challenges in hardware design, communication protocols, and application design. A WSN technology must address these challenges to realize the numerous envisioned applications. This requires modifying legacy protocols for conventional wireless ad-hoc networks or designing new effective communication protocols and algorithms.

Some of the important challenges and corresponding required mechanisms to address them in WSN are mentioned below: (i) Resource constraints are to be handled by efficient use of resources viz. energy aware routing etc. (ii) Adaptive network operation helps in handling dynamic and extreme environment conditions (iii) Data fusion and localized processing techniques should be implemented to eliminate data redundancy. Data aggregation is performed in some applications that are only interested in average, maximum or minimum values. In such cases, the sensor nodes do not have to transport all the sensed data, since the sampled data generated in a period of time can be aggregated by the node for some necessary processing. Finally, only the required data is transported and a large amount of energy can be saved from the reduction of communication. (iv)Unreliable wireless communication is to be handled through reliability studies and ensuring reliability mechanisms. (v) No global identification (ID) for sensor nodes is handled through Data-centric communication paradigm which focuses on data generated by group of sensors. (vi)Fault tolerance is required to reduce impact of unexpected node failures. (vii) Scalability and large scale deployment of sensors needs to be met through low-cost small-sized sensors with self-configuration and self-organization.

VI. Experimental results

Latency Ratio

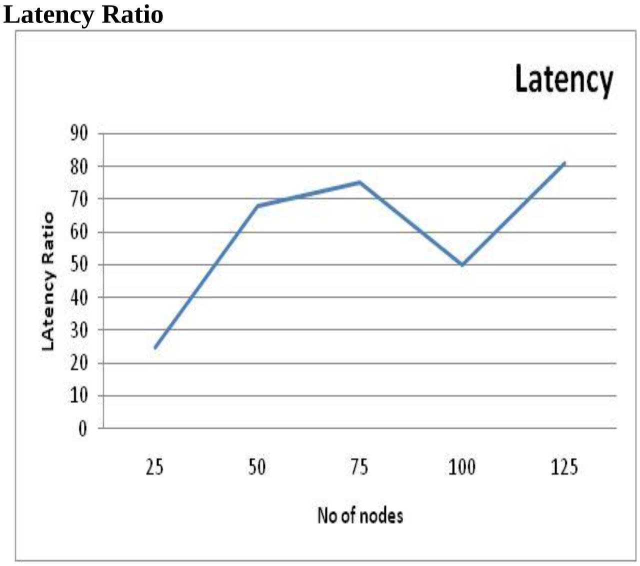

Figure 2: Latency Ratio

Figure 2 represents latency ratio refers to the time required by the network to operate until the first sensor node or the group of nodes in the network runs out of energy. The simple definition can be given as the overall network lifetime as determined by the remaining energy in the network.

Traffic Ratio

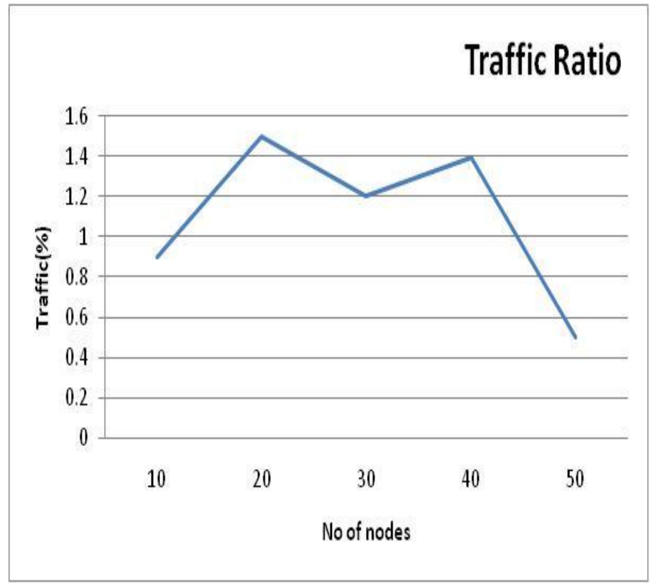

Figure 3: Traffic Ratio

Figure 3 represents denotes the time taken for transmitting the packet from source to destination across a network. The transmission is generally caused due to queuing and retransmission owing to collision.

Scalability

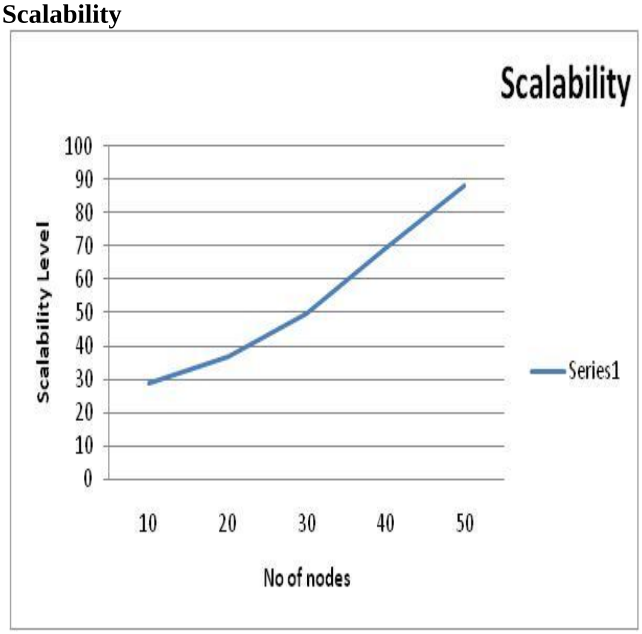

Figure 4: Scalability

Figure 4 represents scalability values of multi-hop based congestion avoidance technique. Their graph values are displayed into low to higher so that scalability values are increased into their process.

Throughput

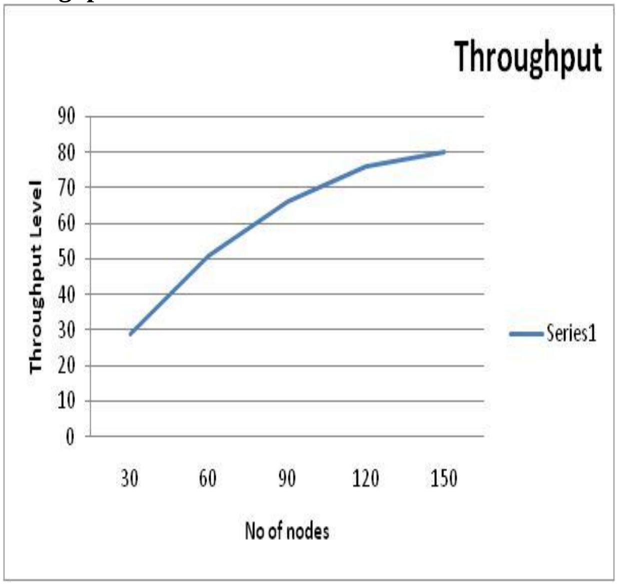

Figure 5: Throughput

Figure 5 represents Network throughput denotes the typical ratio of successful packet delivery over a message channel. The network throughput is measured in bits per second (bit/s or bps) and the higher throughput signifies the better performance.

VI. Conclusion

In this paper, various applications of WSN along with the knowledge of classification and challenges of WSN are discussed. There is currently enormous research potential in the field of WSN. Sensors are already everywhere. But most sensors used today are large and expensive. This paper discussed about wireless sensor network applications, classifications and challenges of required mechanisms in WSN. In this paper analyzed and some techniques, methods algorithms, protocols design, key challenges for enhance the wireless sensor network.

References

[1] Das, T "Employing Cooperative Group Mobility Model For Mobile Target Tracking In Wsn", Ieee Conf. On Applications And Innovations In Mobile Computing (Aimoc), 2015, Pp. 55 – 61.

[2] Zhou Xin-Lian "The Research Of Inner-Cluster Nodes Scheduling Algorithm In Wsn", Ieee Conf On Information Technology And Applications (Ifita), 2011, Pp. 131 – 134.

[3] Gagneja, K.K "Heuristic Clustering With Secured Routing In Heterogeneous Sensor Networks" Ieee Conf. On Security And Privacy Of Mobile, Wireless, And Sensor Networks (Mwsn), 2013, Pp. 9 – 16.

[4] Jambli, M.N. "Transmission Power Control In Mobile Wireless Sensor Networks: Simulation-Based Approach", Ieee Conf. On Wireless Communications And Applications (Icwca 2012),, 2012, Pp. 1 – 6.

[5] Jasleen Kaur, Kamaljit Singh Saini, Rubal Grewal, "Priority Based Congestion Avoidance Hybrid Scheme For Wireless Sensor Network", 1st International Conference On Next Generation Computing Technologies (Ngct-2015) Dehradun, India, 4-5, September 2015.

[6] Anu Arya, Jagtar Singh,"Comparative Study Of Aodv, Dsdv And Dsr Routing Protocols In Wireless Sensor Network Using Ns-2 Simulator", (Ijcsit) International Journal Of Computer Science And Information Technologies, Vol. 5, No. 4 , 2014.

[7] B.N. Jagdale, Pragati Patil, P. Lahane, D. Javale, "Analysis And Comparison Of Diatance Vector, Dsdv And Aodv Protocol Of Manet", International Journal Of Distributed And Parallel Systems (Ijdps), Vol. 3, No. 2, March 2012.

[8] M. Mahmoud And X. Shen, "Esip: Secure Incentive Protocol With Limited Use Of Public-Key Cryptography For Multi-Hop Wireless Networks," Ieee Trans. Mobile Computing, Vol. 10, No. 7, Pp. 997- 1010, July 2011.

[9] M. Mahmoud And X. Shen, "An Integrated Stimulation And Punishment Mechanism For Thwarting Packet Drop In Multihop Wireless Networks," Ieee Trans. Vehicular Technology, Vol. 60, No. 8, Pp. 3947-3962, Oct. 2011

[10] Maryam M. Alotaibi And Hussein T. Mouftah, " Data Dissemination For Heterogeneous Transmission Ranges In Vanets", Ieee Conference On Local Computer Networks, Pp.818-825, 2015.

