

# Analysis of Energy Efficient Techniques of WSN

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**Abstract-** The wireless sensor networks are the decentralized type of network in which sensor nodes can sense the information and pass to base station. Due to self-configuring nature of network sensor nodes join or leave the network when they want. In this review paper, various techniques are reviewed and analyzed in terms of certain parameters. It is analyzed that dynamic clustering is the efficient scheme to increase lifetime of wireless sensor networks.

**Key Words:** WSN, Energy Efficient, LEACH, HEED, TEEN, SEP

## I. INTRODUCTION

The recent enhancements made in the technology involving wireless sensor networks has provided great innovations within the applications that involve it such as the mechanical monitoring, traffic monitoring, cropping, etc. advance creative and productive thoughts are to be generated within this area such that their usage can be more helpful. In the information routing, compression as well as network aggregation, various analyzed methods have been introduced in the recent years. There are numerous nodes deployed within specific area in a wireless sensor network [1]. These nodes are deployed in order to monitor the surrounding area of those nodes. In order to provide communication amongst the nodes present in the network, the sensor hub is present in the network which consists of sensors, actuators, memory and processor. In order to transmit the data through sensor nodes utilizing radio frequencies, infrared, and so on. There is no wired connection present within these networks [2]. A random fashion is set across the nodes and the messages are transferred which thus provides an ad-hoc network environment within the networks. The battery present within the nodes of WSN is of smaller size. Also the nodes are located at really far distances where human is not able to reach. So the major concern within the WSNs is the usage of battery within them. This also affects the overall lifetime of the nodes and thus the deployment of the network. The sizes of various constraints such as battery size, processors, information storing memory and so on are important within these networks [3]. The clustering method is used in order to save the energy available within the sensor nodes. Each of the nodes present within the network can be divided into several smaller groups which are known as clusters with the help of productive network organization. A cluster head is present within each cluster along with all other individual nodes [4]. A two-level order is provided within the clustering method. The higher level is accommodated here by the cluster heads shape. The second part involves the nodes of these networks. The nodes are grouped into clusters through the clustering process. The cluster head is chosen here periodically in such a manner that all the other nodes can communicate with it as per their requirement. The utilized cluster head and cluster formation are two principle criteria for classifications that have been utilized by different clustering algorithm to select cluster head in wireless sensor networks [5]. Probabilistic (random or hybrid) clustering algorithms such as Low Energy Adaptive Clustering Hierarchy (LEACH), Energy-Efficient Hierarchical Clustering (EEHC), Hybrid Energy-Efficient Distributed Clustering (HEED), etc. are included. Non probabilistic clustering algorithms such as Node Proximity and Graph-Based Clustering Protocols, Weight-Based Clustering Protocols, Biologically Inspired Clustering Approaches are introduced. Cluster head is elected by grouping nodes involve in a cluster exist in WSNs clustering. In Cluster set up phase of LEACH protocol every node portrays without considering the current round need to wind up a cluster head [6]. The decision is made by picking a random 0 or 1 number by every nodes present in a network. The node quality is compared with threshold that has been setup and if its quality is less than that of threshold quality then that node will be considered as cluster head. The TDMA mode is utilized by taking network in steady stage in case of cluster head dole out from time slots. The data is sent to cluster head by nodes when steady stage is isolated into frame and only one frame can be sent through a appointed transmission slot. The network lifetime is increased due to some contrast problem to plane multi hop and static routing by LEACH protocol [7]. All present nodes can't be cluster head as it is selected randomly in this protocol that restricts the cluster heads distribution. The less remaining energy nodes will be selected as cluster heads that states it will die first. In large scale wireless sensor network LEACH cannot be used due to sensor nodes limited range of communication as only single hop mode is used for communication between cluster heads and base station. The radio frequency based contactless automatic identification expertise is known as Radio Frequency Identification (RFID) [8]. The active and passive RFID are the two sources of power in RFID and out of two uses of passive RFID gives more advantages than active RFID in terms of size,

battery management, and tag cost, etc. To store or detect physical information for a long time RFID is produced that add fundamental function and enhance the nature of framework. The communication structure of Passive RFID framework is different from Active RFID that makes it difficult to apply same techniques. The all present tags communication is controlled by reader and active RFID Mac has a reader central communication structure [9]. In case of WSN, communication is controlled by nodes itself as their MAC has peer-to-peer communication structure. The RTS/CTS are used to occupy by medium and bearer sensing is used to directly communicating a signal.

## II. LITERATURE REVIEW

**Yang Liu, et.al (2018)** presented for the optimization of the throughput, power consumption and energy efficiency they consider the joint pre-coder design. Multiple access channels are more coherent to with multi-antenna wireless sensor networks [10]. They proposed an optimal decentralized solution and analyses its union as all the existing solution in the previous methods are based upon the centralized system. They also affected the issues of the throughput maximization, consumption of power and EE problems. These two runs in parallel as it provide the semi-analytical solutions and also have strong convergence. They also provide the conditions which are sufficient for the validation of the decentralized method.

**Yi-Hua Zhu, et.al (2015)** presented an ambient RF energy is collected by the nodes in BF-WSNs. It is very essential for the nodes to deliver data which contains low energy consumption rate in order to increase the runtime more. In the applications of the BF-WSN, they implemented the proposed EEDDS method. For this purpose proposed method used the carrier-modulation or non-modulation in which there is difference between the energy consumption rate between transmitting bit 0 and bit 1. [11]. It is necessary to modify the energy-efficient codebook in order to reduce the energy consumed by the sending and receiving nodes as it contains the many bit 0s rather than bit 1s. In the application of the VANET which is the combination of BF-WSNs, RFID systems, or WISP this proposed method can be implemented.

**Mohammed Abo-Zahhad, et.al (2015)** has studied the effects of the power selection transmission on the energy consumption of WSNs. They derived the model for WSNs which is based on energy model in which physical layer parameters are considered, these parameters are based on the energy per successfully received bit [12]. Transmitted power has a single minimum point which is the function of energy per successfully received bit. Therefore, for the optimal transmitted power they derived the analytic expression under Rayleigh fading channel for M-QAM modulation scheme.

**Nabih Alaouil, et.al (2015)** presented the comparison between the different communications protocols specifically designed for the wireless sensor networks. In terms of BER and consumed power, they compared the network coding with ARQ protocols [13]. As per obtained results, it is demonstrated that ARQ protocol is optimal in terms of energy consumption because there is reduction in the number of retransmissions when SNR value exceeds 9.5 dB. In order to reduce the number of retransmissions, they proposed a new protocol known as HCVD protocol. This protocol improves the performance of the system by reducing the energy hence provides the optimal performance.

**Dr. Zainab Tawfeeq Alisa, et.al (2016)** presented the energy consumption rate can be minimized and network lifetime can be increased for which they proposed an intelligent clustering protocol. On the basis of the nodes distribution and the field dimensions, this proposed method performs clustering with dynamic number of clusters. Modified genetic algorithm was utilized by author to select the suitable number of cluster heads and for selecting optimum number of clusters. Hence, for the modification of the genetic algorithm they proposed a method in this paper. The main objective of the genetic algorithm is to minimize consumed total energy by all nodes present [14]. As per simulation results, it is concluded that proposed method has better performance as compared to other methods in terms of network lifetime and energy consumption.

**Fernando R. Almeida Jr., et.al (2016)** presented for wireless sensor networks, they proposed two new approaches such as Fractal Clustering in Wireless Sensor Networks and Similarity Measure in Wireless Sensor Networks. They performed simulation over real data for the validation and comparison of proposed approaches using SinalGo simulator [15]. Results show that there is reduction in the number of messages injected into the network by both FCWSN and SMWSN significantly. The number of messages presented by the SMWSN is slightly smaller than FCWSN. FCWSN remains about 10% lower than SMWSN approach when compared in terms of Root Mean Square Error for which both are low.

**Yao Lu, et.al (2017)** presented a data aggregation technique in the routing process which addresses the issue presents in the wireless sensor network that how to save optimal energy of sensors device. For the qualitatively analyses they proposed a theoretical energy model which contains the advantages of the data aggregation. In this model they also discussed the key

parameters impacts [16]. They also studied carefully, boundary conditions of parameters in order to attain the specific effect of data aggregation. MiXiM framework was utilized as a simulation platform in order to test the efficiency of data aggregation which testifies quantitatively. As per performed comparison on different routing approaches, they presented the benefits of data aggregation on energy consumption.

### III. TABLE OF COMPARISON

Authors Names	Year	Description	Outcome
Yang Liu, et.al	2018	They proposed an optimal decentralized solution and analyses its union as all the existing solution in the previous methods are based upon the centralized system. These two runs in parallel as it provide the semi-analytical solutions and also have strong convergence.	They also provide the conditions which are sufficient for the validation of the decentralized method.
Yi-Hua Zhu, et.al	2015	In the applications of the BF-WSN, they implemented the proposed EEDDS method. For this purpose proposed method used the carrier-modulation or non-modulation in which there is difference between the energy consumption rate between transmitting bit 0 and bit 1.	In the application of the VANET which is the combination of BF-WSNs, RFID systems, or WISP this proposed method can be implemented.
Mohammed Abo-Zahhad, et.al	2015	They derived the model for WSNs which is based on energy model in which physical layer parameters are considered, these parameters are based on the energy per successfully received bit.	Therefore, for the optimal transmitted power they derived the analytic expression under Rayleigh fading channel for M-QAM modulation scheme.
Nabih Alaouil, et.al	2015	Authors presented the comparison between the different communications protocols specifically designed for the wireless sensor networks.	As per obtained results, it is demonstrated that ARQ protocol is optimal in terms of energy consumption because there is reduction in the number of retransmissions when SNR value exceeds 9.5 dB.
Dr. Zainab Tawfeeq Alisa, et.al	2016	Modified genetic algorithm was utilized by author to select the suitable number of cluster heads and for selecting optimum number of clusters.	As per simulation results, it is concluded that proposed method has better performance as compared to other methods in terms of network lifetime and energy consumption.
Fernando R. Almeida Jr., et.al	2016	They performed simulation over real data for the validation and comparison of proposed approaches using SinalGo simulator.	FCWSN remains about 10% lower than SMWSN approach when compared in terms of Root Mean Square Error for which both are low.
Yao Lu, et.al	2017	In this model they also discussed the key parameters impacts. They also studied carefully, boundary conditions of parameters in order to attain the specific effect of data aggregation.	As per performed comparison on different routing approaches, they presented the benefits of data aggregation on energy consumption.

### IV. CONCLUSION

The wireless sensor networks are the decentralized type of network in which sensor nodes sense information and pass to base station. Due to far deployment and small size of the sensor nodes energy consumption is the major issue which reduce network efficiency. In this paper, various energy efficient techniques are reviewed and analyzed in terms of certain parameters.

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