# A REVIEW ON VARIOUS ENERGY EFFICIENT ROUTING PROTOCOLS IN WSN

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**Abstract -** *Wireless sensor network (WSNs) consist of base station and quantity of nodes. Sometimes remote control sensor is employed which are generally known as remote control sensor actuator systems.This paper represents that wireless Sensor Network consist several small distributed sensor nodes offering the consistent monitoring in a variety of surroundings sensor node as armed forces and civil applications. Data transmission is the prominent energy consuming task with wireless sensor / probe network, information reduction might work far better with preserving the nodal energy. The overall objective of this paper is to explore the comparison on various techniques related to WSNs. This paper has also shown the various techniques that give better result for energy enhancement of network.*

**Key Words:** Wireless Sensor Network, Heterogeneous WSNs, Homogeneous WSNs, Clustering, Energy consumption.

## 1. INTRODUCTION

A Wireless sensor network (WSNs) consist of base station and quantity of nodes. Sometimes remote control sensor is employed which are generally known as remote control sensor actuator systems. WSNs are spatially distributed autonomously device using sensors to monitor physical and ecological conditions like temperature, weight and so on .Remote sensors are utilized as part of military, well being, natural, car and other business applications. Sensor nodes are usually operated by low ability batteries and are unattained. WSNs nodes are regularly stationary. Remote Sensor Networks basically consists of sensors. The critical attributes of WSNs Receptors are:

1. Low control
2. limited memory
3. Energy manipulations because of little size.
4. Wireless systems can be conveying in excessive natural
5. conditions and might be prostrate to attacker assaults. Although conveyed in a specially appointed way they need to act naturally established and self-mending and can confront perpetual re-star collection.
6. No crude information is transmitted, to build the life of system.

Four basic component associated with sensor nodes.

- Sensing device
- Processing device
- Power unit
- Transceiever

Sensing unit is employed in order to accumulate the information in analog format. Analog to digital convertors are employed to convert data fetched from analog to digital form. Microcontrollers are part of processing unit.The main task of transceiver is to tie together the sensor nodes with the network. Power device contains the battery needed to operate all the other module of the network[15]
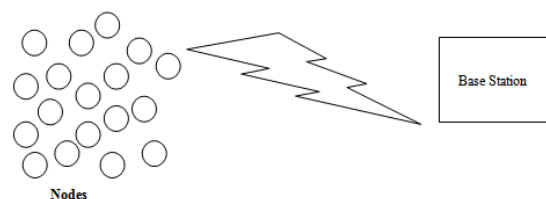


**Fig -1**: Wireless Sensor Networks

### 1.1 Homogeneous wireless sensor network

All nodes are indistinguishable in terms of battery power &hardware complexity. Homogeneous system have unadulterated static bunching. Sensors networks in which hub has same equipment, multifaceted nature & battery vitality in homogeneous sensor network.

In Homogeneous network of system utilized single system topology. In any case, the most imperative disadvantage of homogeneous sensor network and additionally part turn is that all system nodes will have the capacity to go about as bunch heads, and therefore they ought to have the required abilities identified with equipment necessities.

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### 1.2 hetrogeneous wireless sensor network

Heterogeneous remote sensor arrangements comprise of primarily two more hubs having diverse measure of vitality. In this sort of sensor system hub with high measure of vitality went about as group head known as propelled hubs and hubs with lesser measure of vitality called typical hubs.

In Heterogeneous remote sensor systems weight based information transmission is utilized, hub having high measure of vitality can utilized as the brought together point and total information got information and exchange to base station. Heterogeneous system are utilized with the idea of numerous trusting keeping in mind the end goal to achieve the cluster head, the hub which are nearer to group head having more vitality weight on account of handing-off. In Heterogeneous WSN distinctive topologies are utilized &it makes the system an extremely complex system. A Heterogeneous sensor accomplishes lowered equipment cost. Heterogeneous systems are utilizing the idea of numerous hops keeping in mind the end goal to achieve the group head, the hubs which are nearer to cluster head having the more vitality weight in view of transferring.
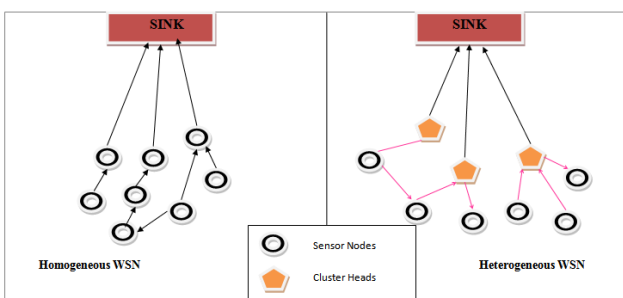


**Fig -2**: Homogeneous vs. Heterogeneous WSNs

## 1.2 Clustering

Clustering is strategy which is utilized as a part of WSNs to lessen the reduced utilization likewise decrease the no. of transmission to base station. Sensor hubs are partitioned into little gathering known as groups. Group head will gather the detected information from all hubs in that bunch. With the goal that hub will exchange their date to base station specifically. They just sense the information to CH of specific cluster.CH will sum up the information, wipe out repetitive information and transmit to the base station.

The nodes with most extreme fitness value will take as Cluster Head. The hub under the correspondence will end up being an individual from Cluster Head and those hub which has greatest vitality alongside Cluster Head is chosen as an Assistant of that group. The hub are supporting as Cluster Head that hub will inspire opportunity to end up Cluster Head if Cluster Head dies.

Advantages of Clustering

1. Transmit entire information to the information sink.

2. Diminish the quantity of hubs participating in transmission.

3. Scalability for large number of hubs.

4. Reduces correspondence overhead for both single and multi-hop.

## 1.3 energy efficient routing protocols in wsn

### 1. Hybrid Energy-Efficient Distributed clustering (HEED)

HEED is actually a multi-hop WSN clustering algorithm that literally brings a energy-efficient clustering routing by using sometimes precisely anxiety of energy. Completely different from LEACH while in the practices with CH dedication, HEED would not pick nodes as CHs randomly. The way in which of cluster manufacture is carried out based upon the hybrid grouping with a couple of parameters. One of the parameters relies upon around the node's remaining over energy, and also the other parameter may be the intra-cluster communicating expenditure.

### 2. Low Energy Adaptive Clustering Hierarchy (LEACH)

LEACH is a popular energy efficient adaptive clustering algorithm that forms node clusters based on the received signal strength. In LEACH the nodes form local clusters with one of the nodes acting as a local sink or cluster head. If the same node would remain as the cluster head throughout the working of the network, it would die quickly because of the extensive load from the participating sensors in the cluster [2]. Hence the rotation of the cluster head in every round is necessary to distribute the load uniformly. Further energy dissipation can be reduced by aggregating the data from various sensor nodes at the cluster head.

### 3. Distributed Weight-based Energy-efficient Hierarchical Clustering protocol (DWEHC)

HEED is really a multi-hop WSN clustering algorithm formula which practically creates any energy-efficient clustering routing by making use of in some cases exactly anxiety connected with energy. Completely different from LEACH within the methods having CH perseverance, HEED wouldn't normally pick nodes since CHs randomly. How connected with chaos create is finished relying on the actual crossbreed bunch having several parameters. One of several parameters relies upon throughout the node's outstanding over energy, along with the various other parameter may be the intra-cluster communicating expenditure.

### 4. Power Efficient Gathering in Sensor Information System (PEGASIS)

The main strategy within PEGASIS will be for every single node to receive by along with send out to close neighbors and neighbors along with alternate becoming the best choice intended for transmission for the BS. This process is going to propagate the action insert equally one of the warning nodes within the system [3]. Many of us to begin with place the nodes at random , within the perform field, and therefore, the particular ith node was at some sort of arbitrary location. The nodes will probably be structured produce a cycle, that may be either done by the warning nodes their selves using a greedy formula beginning with a few node. However, the particular BS can easily work out this cycle along with send out them to all or any the particular warning nodes [3]

**1.5 Multipath routing**

The leading method inside of PEGASIS will probably be for every single node to acquire by way of as well as mail out to help close neighbors plus friends and neighbors as well as alternative growing to be the best selection meant for tranny to the BS. This method is going to propagate the action put similarly among the list of notice nodes inside procedure [3]. Many people to begin with you can put nodes randomly, inside execute subject, and as a consequence, the particular ith node ended up being from getting some sort of irrelevent location. The actual nodes is going to be set up make a period, that could be sometimes created by the notice nodes theirselves utilizing a money grubbing solution starting with a few node. However, the particular BS can readily exercise this period as well as mail out these phones any just about any the particular notice nodes [3]

## 2. RELATED WORK

M.S.MANSHAHIA [11] purposed firefly based energy efficient routing in wireless sensor network. The firefly algorithm rules is implement in this paper that relies on the attractiveness issues on the firefly for energy efficient routing in WSNs. The firefly algorithm result displays the enhancement in the network lifetime and throughput of the network. Chirihane Gherbi et.al.[16] proposed load controlling plus personal adaption clustering with regard to life expectancy widening within huge size within mobile alarm networks. Within this document, a new ordered approach identified as spread energy efficient flexible clustering standard protocol having montage details is for mobile alarm network. Within this document purposed method of array this target: minimize the overall multi-level electrical power usage, steadiness period of multi-level, lengthen the actual lifetime of multi-level ,the actual clustering needs to be effective within complexness with massage plus period ,download controlling should be carried out well. Within this document purposed tasks are simulated simply by multi-level simulator. The primary target in this document would be to design and style sleeping command legislation this lower the actual anticipating worth of price purpose symbolize both equally electrical power usage cost plus possessing expenditures with regard to backlogging packet. Fateh boutekkouk et al. [7] proposed of your hybrid approach to inflate the actual lifetime of heterogeneous mobile alarm network. Within this document author consist of a couple meta-heuristics that are: firefly plus simulated annealing to increase the actual lifetime of heterogeneous mobile alarm multi-level having repaired base station by reduction of the actual interaction consumption. A consist of approach offers the actual clustering as well as the cycle approaches. This particular marketing algorithm formula aims to search for the optimal clustering over the multi-level nodes making use of the firefly inside just about every cluster the idea attempts for the greatest cycle using simulated annealing. N.Javaid et al. [2] purposed a novel clustering based routing technique: Enhanced Energy Efficient Clustering Scheme (EDDEEC) for heterogeneous WSNs. This technique is based on dynamical changes and

with more efficient the cluster head (CH) election probability. EDDEEC is adaptive energy aware protocol which dynamically changes the probability of nodes to become a CH in a balanced and efficient way to distribute equal amount of energy between sensor nodes.Nafaa Jabeur et al .[5] purposed recurrent problem of node redundancy in heterogeneous wireless sensor network using bully strategy. In this paper, at the end author presented an analytical approach for the detection and relocation of redundant sensor of wireless networks. In this paper a bully approach is used for evaluations of overlapping between dissimilar sensing ranges.Salah Abdel-Mageid et al. [11] purposed novel decentralizing approach enabled to consider the heterogeneous characteristics. The performance comparison is also introduced to study how to design the parameters affections. Simulation result show that purposed solution achieved high coverage performance in few rounds with minimum energy consumption and minimum computation. Deepak R Dandekar et al. [1] in this paper have studied the problem of deploying additional relay node placement for multi-path connectivity in heterogeneous wireless sensor network. In this paper purposed that particle swarm intelligence algorithm in placing the relay nodes optimally. In this paper, in future would like to conduct same experiment to finding the optimal number of heterogeneous wireless sensor relay nodes to be placed for multipath connectivity in heterogeneous wireless network.Ahmed Al-Saadi et a.[ 13] in this paper, a cognitive network framework for heterogeneous wireless networks is proposed, in which the network protocol stack is integrated with a semantic system. The proposed framework is used to provide on the basis for building smart network that observed the data from different layer in the network protocol stacks allowed to adding ontology to describe the data, searching the visualized data.Ahmed M.Khedr et al. [8] purposed a new algorithm for finding the minimum connecting coverage of queried region by discovering the redundant sensor for heterogeneous wireless sensor network, each with based on sensing range and is not aware of its location or direction of its neighbor. In the end of this paper simulation result shows that algorithm which is used that extend the lifetime of network. In future research, it will more work to focusing on distributing and localizing solution for practical deployment.Pratyay Kuila et .at.[18] In this paper, an Energy Efficient Load Balancing algorithm that addressed energy efficiency as well as load balancing have been discussed. The simulation result show that efficiency of designed algorithm in term of load balancing, energy efficiency ,execution time, the number sensor nodes dead during the network lifetime

**COMPARITIVE ANALYSIS**

Table 1 has clearly shown comparison among available techniques. However comparisons have clearly shown that the combination of all techniques compared with reviewed paper to find which technique is perform better than the available methods to improve the energy enhancement & lifetime of network in wireless sensor networks. Table 1 shows that comparison of all techniques that are used in

proposed paper. Table2 has the clear comparison between the surveyed papers that show which algorithms yields better results in enhancing the energy and lifespan of network. Table 2 has clearly shown comparison among all technique, with their parameters, initial energy of networks, and number of bits present for message passing, number of nodes.

**Table -1:** Various techniques described through following comparison

This section comparison between various techniques based on network category, issue, benefits used to enhance the energy of network.

| Ref. no. | Year | Techniques | Network Category | Issues | Benefits | Limitations |
|---|---|---|---|---|---|---|
| [2] | 2013 | Clustering routing technique | Heterogeneous | Energy consumption in WSNs | Better lifetime of network and stability period, enhancement of energy | Optimize to divide the sensor field among consistent number of clusters. |
| [7] | 2015 | Meta-heuristic used: firefly and simulated annealing | Heterogeneous | To reduce the energy consumption and enhance the lifetime of network and find best cluster head ,best optimal path in the network | Extend the lifetime of network using firefly and simulated algorithm and enhancement of energy | Used proactive protocol |
| [5] | 2016 | Bully approach | Heterogeneous | Recurrent problem of node redundancy in Heterogeneous WSNs | Improving relocating of redundancy of sensor | Complexity increase while solve the problem of redundancy |
| [8] | 2015 | Localization coverage determination | Heterogeneous | Extend the network lifetime using distributed algorithm | Integration of Heterogeneous WSNs with IP is backbone of 4G network | Handoff delay, packet loss, packet delay complicated to solve |
| [3] | 2013 | Mobility in heterogeneous wireless network | Heterogeneous | Coverage ratio & lifetime of network | Better lifetime of network& coverage ratio | ECRM protocol is highly Scalable but if the terrain is uneven extra region is added after the step of shifting the node it will be difficult to organize the network. |
| [4] | 2012 | Mobility technique | Heterogeneous | Mobility management with all IP in 4G network issue such context of network | Integration of heterogeneous network with 4G is backbone provider | Handoff delay, packet loss, packet delay complicated to solved. |
| [1] | 2012 | Particle swarm optimization technique | Heterogeneous | Deploying minimizing additional nodes | Using PSO algorithm deploying a minimum additional relay node to process multipath connectivity. | PSO algorithm difficult to discontinuous problem in variety of field |
|  | 2015 | Firefly and particle | Heterogeneous | Network lifetime and throughput and find | Improve the lifespan and throughput of | Difficult to improve the Stability period of |

| [12] | | swarm intelligence algorithm | | the best optimal path in network using cluster head at base station | network | network |
|---|---|---|---|---|---|---|
| [11] | 2011 | Adaptive relocation strategy | Heterogeneous | Increase lifetime and reliability network, without significantly increase the cost, energy consumption | Achieve high performance in few round with minimum energy consumption & minimum computation | Different operations are performed on the basis of characteristics of their strategies |
| [9] | 2016 | Efficient scheduling method based PCO model. | Heterogeneous | Collision due to hidden nodes. | Achieve high rate of data gathering with reasonable coverage time in both Heterogeneous and homogeneous network. | PCO MODEL has hidden node problem. |
| [13] | 2015 | Cognitive network framework | Heterogeneous | Increase traffic demand in network is expected to increase thousand fold. | Provide higher network capacity wider coverage high quality of service, analyzing search the visualization data | Framework is applicable in network layer with symmetric system. |

## 3. CONCLUSION AND FUTURE WORK

In the application based WSNs situation, energy and bandwidth of the sensors are valued resources and essential to consume proficiently. In this paper the energy enhancement of homogeneous and heterogamous wireless sensor networks have been represented. Due to energy consumption the lifetime of the network would decrease; to enhance the energy and lifetime of the network. The review has shown that various algorithms which are used to improve energy enhancement of network. But still there are some issues left which decreases the network life time so to overcome these issues in near future we will propose the firefly search based optimization technique for energy efficient routing algorithm as well as the use of the compressive sensing also increase the performance further.

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