



PARAMETRIC ANALYSIS OF ENERGY AWARE CLUSTERING AND ROUTING PROTOCOLS USED IN WSN

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Abstract: The evaluation and up gradation of wireless sensor Network (WSN) requires transfer of data from source to destination. Hubs inside remote system are sensors having constrained vitality related with them. Hubs working together frame groups. Information transmission happens from unmistakable groups towards base station. Vitality of sensors should be saved keeping in mind the end goal to improve lifetime of system. This paper presents the overview of various existing techniques used to enhance lifetime of network. Lifetime of network ensures degradation in terms of packet drop ratio. The extensive parametric analysis of some popular protocols has been done in this paper which can be used for future enhancements.

Keywords: WSN, Clusters, Lifetime, Packet drop ratio

1. INTRODUCTION

Remote sensor organize [1] comprises of spatially appropriated gadgets used to keep up physical or ecological conditions. Hubs utilized inside WSN could be of unmistakable arrangement. These hubs frame heterogeneous condition. Heterogeneous environment requires protocols in order to establish communication among distinctly configured nodes. IEEE 802.11 standards established for Wi-Fi connectivity is commonly used protocol for transmission within WSN. [2] Nodes following common protocols form clusters. The Present time is such where people don't have much time. The people wish to carry out their occupations in a hurry. Physically nearness at the specific area may not be plausible. For this reason client depends vigorously on innovation. Cell innovation is one of the instrument by which client will move the data without truly to the inaccessible place. The cell system is accomplished with the assistance of confinement. The restriction thusly is finished by the utilization of obscure hubs and stay hubs. The grapple hubs are those through which data about the obscure hubs can be gotten. The obscure hub position at the end of the day will rely on the stay hub positions. It has much real application in agribusiness explore. Other than this there is considerably more materialness of WSN in University and schools however working with restricted computational power and constrained memory. It gives full administration of remote sensor items, programming advancement and arranged counseling administrations to business. WSN are utilized as a part of numerous territories to screen a physical condition, for instance,

- Source of Light
- Pressure taking care of component
- Sound creating frameworks
- Humidity checking framework
- Checking Soil ripeness recognition
- Determining Air Quality checking
- Quality of water checking

- Measurement of Object Attribute, for example, Mass, Velocity, Motion, Scale and Position
- Mixture of Soil with fertilizer.

Remote correspondence comprises of hubs which are in charge of transmission of data from source to the goal without utilizing wired component. The Sensor hubs are utilized for this reason. The sensor hubs will transmit the data to the following hub in arrangement whose span crosses with the other sensor hub range. The provisions for hubs are broad. Point must be minimized, vitality powerful, multifunctional, and remote. At the point when all these point associated their shape arrange and by this the principle thought process can be gotten. For instance, if there is a data accessible for need of water among all segments of the field, put the focuses are in the dirt to frame a system. After it system can accumulate information and transmit information to primary PC.

Sensor is utilized as a part of the home likewise, for example, cooler and microwave. These are brilliant machines we can set its planning when nourishment is get ready then it consequently give caution.

Remote Sensor Network is more advantageous and more noteworthy focal points over regular wired Sensor. They are utilized as a part of any condition particularly when regular wired sensors are unrealistic. They additionally diminished the cost and postponement.

In WSN there is no need that system site get close to it we can impart the system site get a long way from this. Remote sensor organizes gather information which is in vogue, and we get data about the information.

Sensor unit comprise of Analog to advanced converter. The ADC will get the simple flag and changes over it into the computerized shape. The advanced information has greater lucidity related with it. The discrete signs will be its case. The sensor hubs will be influenced by number of parameters. The parameters will choose the lucidity by which transmission happens. The parameters are separated into following classes:

- Temperature

- dampness and

- Vibration

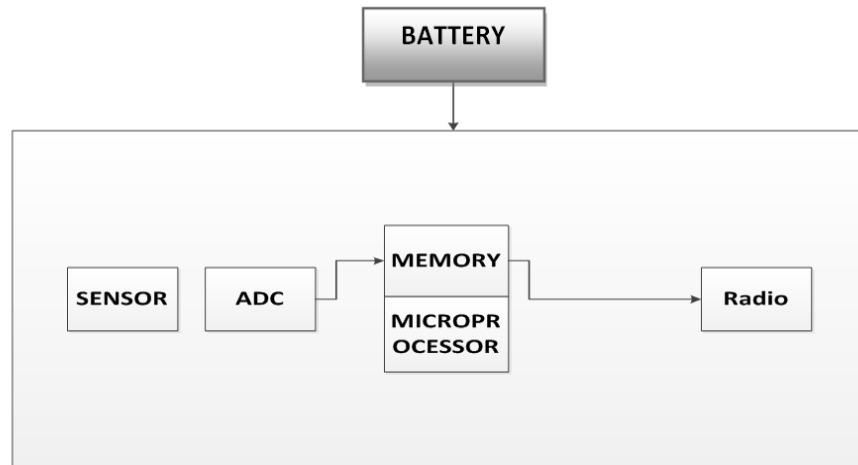


Figure 1: Wireless Sensor Network Operation[1]

There are such a significant number of capacities, for example, environment, sense movement, and measure light quality.

- **Power Source:** The power source is the basic segment related with the WSN. It is utilized to give the ability to the sensor hubs inside the WSN. Without battery no sensor can work. The upside of sensors is they are little vitality devouring gadgets which don't require a great part of the power source.
- **Radio:** This is a little gadget which is utilized to transmit the data from source hub to the goal hub. The source is known as Radio source and goal is known as Radio Destination.
- **The Electronic Brain:** The sensor hub will comprise of remote system which is utilized to transmit the data to goal. The microchip chip is utilized to coordinate the information toward the goal. The microchip will have number of pins related with it. Each stick will have certain capacity related with it. The power source is a basic piece of the electronic mind. It is utilized to give the ability to the sensor hubs inside the WSN. Without battery no sensor can work. The upside of sensors is they are little vitality devouring gadgets which don't require a great part of the power source. The Radio is likewise utilized as a part of request to guarantee remote correspondence. This is a little gadget which is utilized I request to transmit the data from source hub to the goal hub. The source is known as Radio source and goal is known as Radio Destination.

In horticulture industry WSN are for the most part utilize. By this there is free of cost for agriculturist for the repairs of wiring in a difficult circumstance. To screen water tank level WSN utilizes gravity nourish water framework to check utilizing weight transmitter. The proficiency of pumps can be enhanced utilizing WSN gadgets. Likewise by this influence utilization of water to can be computed and all the issue of charging are illuminated by this. Water system computerization permits more useful water utilize and diminishes squander.

- **Precise agribusiness:-** Due to Wireless sensor systems clients can screen the development of harvest. So by this rancher can take choice which is gainful for edit as ahead

of schedule as could be allowed. So at the season of gather this thought assumes an essential part

- **Water system administration:** -So when continuous information is transmitted, brilliant water system of the yield can be accomplished. WSN give the data in regards to the ecological condition for e.g. temperature, rain, mugginess and soil dampness. Thus, by the assistance of WSN ranchers can utilize adjust measure of water as per their requirements and reduction the cost and by this there is change in the nature of the final result. Likewise by this system different actuators can be overseen in the frameworks utilizing remote foundation.
- **Nurseries:-** WSN can be useful in green house impact. So by this ecological condition can be handled. So this office is given to agriculturist that if any evil impact of condition happen or the condition by which rancher's field or product get hurt this all data gave to agriculturist by email or by telephone ,instant messages

Presently in nowadays there is fundamentally center in nurseries, with the goal that misuses of various harvests can be precluded. So a superior sensor n/w required which give all these data precisely .Basically for this a numerous scattered sensor control this conditions. Additionally this system accommodating in open surface close to this it is useful in soil likewise i.e. again an open surface.

Clustering[4] in WSN is formed so that minimum energy is consumed during transmission of data. Formed clusters consist of large number of nodes which may have same or distinct configuration. The nodes within the clusters if belongs to same configuration then homogeneous clusters are formed. In case nodes are of distinct configuration then heterogeneous clusters are formed. Nodes[5] selection from clusters is critical that leads to selection of cluster head.

Bunch head from specific group is hub having greatest vitality. Every one of the hubs [6] from an unmistakable groups exchange the information towards chose bunch head from their bunch. Information at that point is transmitted starting with one bunch head then onto the next group head until goal hub that is base station is come to. Packet drop ratio is considerably reduced as maximum energy node is selected for transmission of information. As energy decays [7], sensors unable to hold the packet and hence packet is dropped. As more and more packets arrive at the sensor

having minimum energy, packets are dropped. This enhances packet drop ratio considerably. Within clustered environment techniques were researched over to enhance performance in terms of packet drop ratio during degradation of sensor energy. This paper presents comprehensive analysis of techniques used to enhance lifetime and decrease packet drop ratio. Highlights of this paper is listed as under

- Energy efficient protocols in WSN for enhancing lifetime of networks are discussed.
- Techniques used to minimize packet drop ratio are identified.
- Cluster head formation techniques are discussed in detail.
- Comparative analysis of various protocols is presented for determining best possible protocols out of available protocols.

2. ENERGY EFFICIENT CLUSTERING TECHNIQUES IN WSN

Large number of protocols researched over a decade to enhance lifetime associated with the network. This section discusses various protocols falls under energy efficient category.

1.1 Low Energy Adaptive Clustering Hierarchical Protocol(LEACH)

Low Energy Adaptive Clustering hierarchical protocol [4],[8] is used to enhance energy efficiency associated with transfer process. Time division multiple access protocol is integrated within LEACH. Cluster head selection is a problem within LEACH. In fact cluster head selection does not take place and data is transmitted from transmitter towards random selection of node selected as head. Aggregation is performed at cluster head and when threshold value is reached, packets are transmitted forward. In case cluster head energy dissipated completed, all the packets aggregated at node will be lost. Properties associated with LEACH are listed as under

- Hierarchical in nature
- Random Cluster Head Selection is involved
- Adaptive membership of cluster
- Aggregation of data at cluster head
- Communication involves nodes and cluster head
- Threshold values involve during transmission

LEACH protocol is represented as under

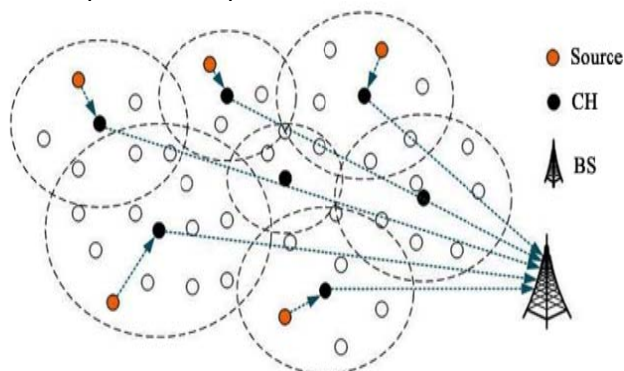


Figure 2: Leach Protocol[3]

1.2 Distributed Energy Efficient Clustering Protocol(DEEC)

This protocol [9][10] is advancement associated with LEACH. Cluster head selection is complex in case of DEEC. Most extreme vitality hubs are chosen among accessible hubs. The hub with the most elevated likelihood of saving vitality is chosen as bunch head. A circulated multilevel bunching calculation for heterogeneous remote sensor systems is considered with following qualities

- The bunch leader may be chose Eventually Tom's perusing An likelihood dependent upon the proportion between the measure lingering vitality available toward each hub and the Normal vitality of the system.
- That lifetime of a bunch leader will be chose as stated by its beginning vitality What's more remaining vitality. With the goal generally those hubs with secondary starting also remaining vitality have a finer opportunity to get An CH.
- DEEC will be executed dependent upon those ideas about drain algorithm. Those part of group mind is turned around constantly on hubs of the organization with settle on vitality dispersal uniform.
- Two levels for heterogeneous hubs are viewed as in this algorithm should accomplish more system lifetime Furthermore a greater amount compelling messages over other traditional grouping calculations.
- It additionally meets expectations finer for multilevel heterogeneous networks.

Previously, DEEC, every last one of hubs must bring the perfect regarding aggregate vitality Also lifetime of the system. Normal vitality of the system will be utilized concerning illustration those reference vitality.

DEEC protocol is represented through the following figure

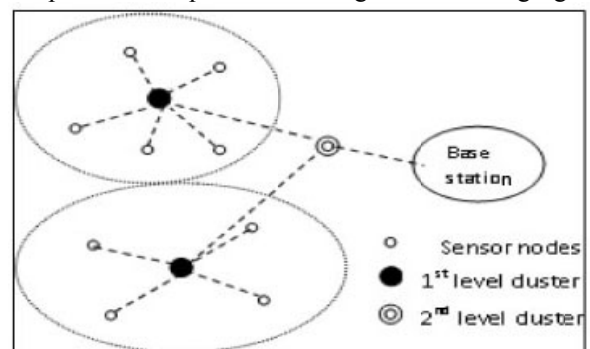


Figure 3: DEEC protocol[3]

1.3 Stability Election Protocol(SEP)

SEP[10] concentrate the impact of heterogeneity about Clusters, as a long way similarly as their vitality, for remote sensor arranges that would progressively clustered. Accompanying properties are recognized.

- On these frameworks a part of the hubs advanced at turning into bundle heads, aggregate the majority of the data about their aggregation people what's more, transmit it of the sink.

- it acknowledge that a rate of the people of sensor hubs may be furnished for additional vitality stakes which may be An wellspring about heterogeneity which might happened starting with those underlying setting or Similarly as the operation of the framework developments.
- it also think about the sensors need aid subjectively (consistently) appropriated Also need aid not versatile, the directions of the sink and the estimations of the sensor field need aid referred to.
- it may be accepted over sep that hubs can't detract full ideal gathering of the closeness from claiming center heterogeneity.
- SEP, An heterogeneous-mindful gathering should draw out the time between time When those passim of the vital center (we imply should Concerning illustration quality period), which is pivotal for exactly provisions the place the feedback from the sensor a must be strong. SEP depends on abounding chase probabilities of every hub to end up agglomeration go to the blow of the animation in every hub.

SEP[4], [5] is advance accessory with DEEC. Energy is conserved and lifetime of arrangement is bigger appreciably by the use of this protocol.

Representation of SEP is as under

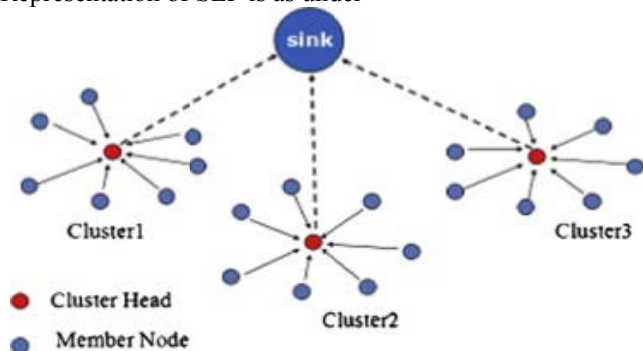


Figure 4: Representation of SEP[3]

1.4 Enhanced Distributed Energy Efficient Clustering Protocol (EDEEC)

Remote sensor Networks (WSNs) [6] comprises about over the table discretionary sending of vitality obliged sensor hubs. Accompanying properties exists for EDEEC.

- Sensors hubs need dissimilar limit on recognize and send distinguished data will base station (BS) or sink.
- Identifying What's more What's more transmitting majority of the data towards sink obliges generous measure from claiming vitality.
- In WSNs, save animation and dabbling the lifetime of arrangement are absurd difficulties. Many administering conventions accept been proposed with a specific end ambition to achieve animation abundance in amalgamate condition.
- EDEEC for the vast majority a piece comprises of three sorts of hubs on amplifying those lifetime Furthermore robustness about framework.

Enhanced distributed energy efficient clustering protocol is advancement of DEEC that conserve energy and reduce packet drop ratio considerably. Further enhancement in DEEC can be made to enhance performance DEEC by reducing distance between nodes in which data is being transmitted.

Today's globe needs a portion innovations on satisfy their schedule fill in. WSN[1] is that engineering which fulfills those schedule worth of effort of the the public eye. Remote sensor organize faculties those physical planet if it may be temperature, pressure, stickiness Furthermore some other earth exercises. WSN will be utilized within an earth the place the wires or link would not could reasonably be expected with achieve. It is not difficult with introduce compared with alternate cables system. Now, these day's WSN would utilizing principally for those information exchange motivation. Sensor nodes[7] in the remote organize exchange the information packets starting with sourball will end. Remote sensor system incorporates sensors hubs and a build station (sink) Also there are Along these lines a significant number sensors which make a system. Every last one of sensor hubs On An organize correspond with one another Furthermore exchange the information bundle starting with sourball hub of the sink. Sensor hubs might speak straightforwardly with those build station. Sensor nodes absorb a lot of activity while abstracts transfer. On the added hand, sensor nodes additionally absorb activity afterwards appointment the abstracts packets. Due to this consumption, the lifetime of the arrangement additionally gets reduced. This is the above affair of the sensor network. There[8] are added issues of the arrangement but activity burning and advance the lifetime of the network. Taking these issues in concern, there is one adjustment which is actual abundant advantageous to boldness these problems alleged clustering. Clustering, the address in which ample arrangement arena is disconnected into abates one. With this technique, sensor nodes do not crave absolute advice with the abject station.

Representation of EDEEC is as under

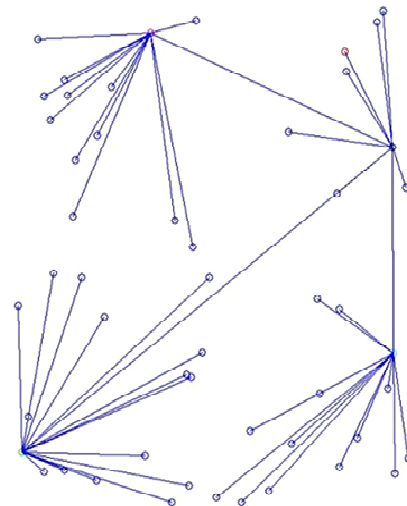


Figure 5: Representation of EDEEC[9]

For each cluster, there will be a bunch leader which collects the information starting with every last one of system hubs et cetera transmits that information of the base station. Those bunch head may be chose on the premise from claiming greatest vitality of the hub. Those hubs which need most elevated vitality will be chosen to group mind. Fundamentally just group head may be answerable for the correspondence in the organize. Group mind needs that are only the tip of the iceberg vitality to that information amassed also transmitting those information. With the goal following transmission of the data, its vitality diminishes

and the hub which need second most noteworthy vitality is chose to bunch head. There may be so a number grouping conventions which not best lessens that Vitality utilization as well as improve the system lifetime. These conventions are LEACH, HEED, DEEC, EDEEC, sep and so forth throughout this way, observing and stock arrangement of all instrumentation may be enhanced. These conventions would cluster-based protocol Furthermore a considerable measure about worth of effort need been done with these conventions. Drain is the 1st protocol which originated under the presence in the grouping protocol. DEEC may be likewise a cluster-based protocol On which bunch leader may be chosen dependent upon those remaining vitality of the sensor hubs and the Normal vitality of the system. EDEEC may be the improved rendition of the DEEC protocol What's more obliges a heterogeneous organize. Drain is the homogeneous system.

Next section describes background analysis or literature survey to determine best possible protocol for future enhancement.

3. EARLIER WORK

Techniques have been devised for improvement of performance in WSN. The WSN performance is critically analyzed using this paper. The worth of study is proved using this literature survey.

[2]in 2014 has been proposed distance and energy aware LEACH. The cluster head selection in this approach was adaptive and allow packet drop ratio to reduce considerably. The aggregation mechanism was the drawback associated with this approach. In case cluster head go down, every packet aggregated at source could be lost.

[10]have been proposed EAP for conserving energy during transmission of data from source to destination. Inter cluster coverage was introduced in this approach. Data gathered at particular cluster was according to probability distribution factor that reduces energy consumption and enhances lifetime of network.

[11]have been discussed energy efficiency achieved through LEACH protocol. Time division MAC was integrated to achieve energy efficiency and lifetime within the WSN.

[12]have been proposed a mechanism to analyze energy dissipation through Multi-Chain PEGASIS. This protocol constructs a chain of routing path. Multi hop routing was used under PEGASIS. Overall protocol was energy and power efficient but complex. In other words time and space complexity was enhanced using PEGASIS. Future modifications required in order to enhance performance of examined system.

[10]have been proposed LEACH, a hierarchical protocol for achieving energy efficiency within WSN. Adaptive cluster head selection allows performance enhancement however aggregation mechanism used within WSN has merits and demerits associated with it. Energy conservation was achieved with the risk of enhancement of packet drop ration in case of cluster head failure.

[13]has been proposed in 2014 energy efficient DEEC protocol. DEEC protocol uses probability distribution function to determine cluster head out of number of nodes available within WSN. Probability assigned with each node within WSN was analyzed for selection of cluster head. Probability associated with nodes varies during each round.

Higher the probability more will be chance of node being selected as cluster head. DEEC performance decreases by the application of aggregation mechanism leading to increase in packet drop ratio.

[6]have been proposed enhancement in DEEC protocol to achieve more energy efficiency. Lifetime of network is significantly improved by the application of E-DEEC. As packets moved from one node to another, energy associated with nodes will be analyzed. Node having highest energy will be selected as cluster head. Packet is being received by node having highest energy. Lifetime of network was considerably enhanced but packet drop ratio increases hence requires improvement.

[14]have been proposed a sleep awake protocol for WSN data transmission. Node being idle was set to sleep and energy conservation was achieved. The problem of topology breakage occurred as node was made to sleep. In order to wake the node sufficient amount of energy was required to be dispensed with.

[9]have been discussed a super energy aware protocol by accomplishing modifications to the existing DEEC protocol. Modified mechanism of electing cluster head was proposed. Node selected as cluster head was evaluated against several criteria's before electing it as cluster head. Complexity in terms of cluster head was extremely high.

[15]have been proposed a priority based application specific congestion control algorithm. Packets can be initiated through any node and hence traffic could be a problem. To handle traffic, congestion control mechanism was proposed by maintaining priority queue. Packets from distinct nodes were maintained within queue. As congestion becomes high, enqueue operation takes place. As traffic becomes moderate dequeue operation takes place. This mechanism results in decreasing packet drop ratio. But energy consumption in this mechanism still requires improvement.

[16]have been advised gateway based energy routing protocol (M-GEAR) for WSN. Depending on their location in the sensing area, they divided the nodes into four zones. In this protocol, they placed the base station out of the sensing zone and placed a gateway at the middle of the sensing area. The node uses the direct communication if the distance of the sensing node from the base station or gateway is less than the prescribed distance. They also divided the remaining nodes into equal zones. Selected cluster heads in each zone are independent of each other. They compared the performance of proposed protocol with LEACH. Analysis results show that their assigned protocol perform greatly basis on the consumption of energy and lifespan of the network.

[3]have been said that in the upcoming time, WSNs require a great need of spreading the nodes and also enhance its applications in all fields because in the future most of the devices will be connected to each and everything. So spreading of these nodes is the greatest challenge, keeping this in mind a new protocol is given called TDEEC used for the heterogeneous network. TDEEC protocols use three levels of heterogeneity. It is a reactive protocol and used basically for reactive networks. Reactive networks are those which react quickly to any change arise in any parameter.

The comprehensive literature survey conducted in this paper suggests, considerable improvement in terms of energy efficiency and packet drop ratio within WSN is

required. Some techniques suggested such as DEEC provides efficient low complexity mechanism to accomplish the same but distance based criteria's are absent within

DEEC. To improve the performance of DEEC, distance between nodes must be considered. This could be the future course of action.

4. COMPARISON OF ENERGY AWARE SCHEMES WITHIN WSN

Comparison of protocols consuming energy, initial energy, number of dead nodes and complexity is given as under
Table 1: Comparison of protocols in terms of energy consumed and complexity

PROTOCOL	YEAR	Number of Rounds	Number of Dead Nodes	Initial Energy	Residual energy	Complexity
Modified LEACH[17]	2017	2000	90 out of 100 after rounds complete	1.5 Joules	0 after all the rounds	High
PAGASIS[18]	2017	2000	80 out of 100 after all the rounds	1.5J	0.35 after all the rounds	High
Multi hop Scheduling[19]	2016	2000	60 out of 100 after all the rounds	1.5J	0.2 after all the rounds	Low
DCBRP[20]	2016	2000	85 out of 100 after all the rounds	1.5J	0.15 after all the rounds	High
ECS[21]	2016	2000	62 out of 100 after all the rounds	1.5J	0.30 after all the rounds	Low
ELEACH[22]	2015	2000	70 out of 100 after rounds complete	1.5 J	0.5 after all the rounds	Low
HEED[23]	2014	2000	73 out of 100 after all the rounds	1.5J	0.25 after all the rounds	High
SEP[24]	2013	2000	80 out of 100 after rounds complete	1.5 J	0.3 after all the rounds	High
TTDD[25]	2005	2000	85 out of 100 after all the rounds	1.5J	0.29 after all the rounds	High

Comparison of energy aware schemes presented in this section provides clear and concise view of optimal technique within WSN during data transmission.

Table 2: Comparison of Techniques of Clustering used within WSN

Protocol	Year	Merits	Demerits	Remarks
Mobile Agent Driven aggregation protocol [26]	2017	<ul style="list-style-type: none"> Lower energy consumption in SGLC compared to LEACH 	<ul style="list-style-type: none"> Large overhead due to complex data communication 	It is distributed efficient energy consumption and distribution protocol.
CCM[27]	2016	<ul style="list-style-type: none"> Energy consumed in the selection of cluster head is less as compared to leach 	<ul style="list-style-type: none"> Chain head selection is complex and has more overhead associated with it 	Mixture of flat, hierarchical and location based routing is combined
Multi hop Clustering Protocol [28]	2016	<ul style="list-style-type: none"> GAF increase the network lifetime by saving energy Routing fidelity is maintained 	Large traffic injection and delay is not predictable	It is a location based least energy consumption protocol
TDEEC[9]	2016	<ul style="list-style-type: none"> Modified DEEC 	<ul style="list-style-type: none"> Slotting is used hence it is 	DEEC with time

		Clustering protocol provides better performance in terms of energy consumption then DEEC	more complex	division is considered hence overall operation is faster
Energy Optimization Protocol [29]	2015	<ul style="list-style-type: none"> • Every node in the cluster may become cluster head depending upon the amount of energy node possess • Collisions are avoided since leach protocol is accompanied with time division multiple access mechanism 	<ul style="list-style-type: none"> • Difficult to implement in large networks • Lack of uniformity in selection of cluster head 	Earliest protocol associated with clustering
PANEL[30]	2015	<ul style="list-style-type: none"> • Panel is energy efficient that ensure load balancing and long network lifetime • Supports asynchronous applications 	<ul style="list-style-type: none"> • Clusters are predetermined • To determine geographic position information, special conditions are needed, which is not always available 	This is efficient node selection algorithm for handling cluster
TTDD[31]	2015	<ul style="list-style-type: none"> • Resolve the numerous mobile sinks and moving problem of sink in large scale WSNs • Suitable to event detecting WSNs among irregular data traffic 	<ul style="list-style-type: none"> • Large latency • Low energy efficiency • TTDD require sensor nodes to be stationary and location aware 	It is a two tier energy consumption minimization protocol
PEGASIS[32]	2015	<ul style="list-style-type: none"> • Uniform load balancing • Reduce cluster head selection over head • Packet drop ratio decreases 	<ul style="list-style-type: none"> • High delays in transmission • Scalability is least • Time varying topologies make it complex to use 	Load balancing is handled efficiently in this protocol as compared to LEACH
TSC[33]	2015	<ul style="list-style-type: none"> • Redundant data is reduced 	<ul style="list-style-type: none"> • Asymmetric node balance 	Modularity is provided by dividing the network into concentric circles hence better energy consumption is achieved
PASCCC[15]	2014	<ul style="list-style-type: none"> • Priority based data transformation • Packet drop ratio is low 	<ul style="list-style-type: none"> • Energy consumption is high 	Priority is assigned but starvation problem can be present
SEP[24]	2013	<ul style="list-style-type: none"> • It is better in terms of packet drop ratio 	<ul style="list-style-type: none"> • More complex as compared to leach 	Energy consumption is less as compared to previous algorithm
Clustering protocol for WSN[34]	2010	<ul style="list-style-type: none"> • Solve the problem of area with overlapped sensing coverage and sensing hole • In LEACH-VF some nodes can be moved to coverage inside the cluster are 	<ul style="list-style-type: none"> • Poor energy efficiency • Load balancing is not up to the mark 	Area independence is achieved
Enhanced Energy Efficient Protocol[35]	2010	<ul style="list-style-type: none"> • Data transmission can be controlled by varying two thresholds • Well suited for time critical applications 	<ul style="list-style-type: none"> • Whenever thresholds are not meet , the node will not communicate • Data may be lost if CHs are not able to communicate with each other 	Hierarchical routing protocol that is used to minimize energy consumption of clustering algorithm
Energy Aware Protocol[10]	2009	<ul style="list-style-type: none"> • Routing Scheme used is fully distributed • Local Communication is 	<ul style="list-style-type: none"> • Communication Overhead is high due to random cluster head selection 	Better connectivity of cluster heads

		supported for least complexity <ul style="list-style-type: none"> • More uniform in nature • High Energy Efficiency and reliability 	<ul style="list-style-type: none"> • Extra Energy consumption in selection of cluster head 	
Single Hop Clustering protocol[36]	2009	<ul style="list-style-type: none"> • Achieve Load Balancing • Clusters are variable in size 	<ul style="list-style-type: none"> • Communication overhead is high • Energy Consumption is exceedingly high 	Energy efficient protocol used commonly at media access control layer within data link layer
EESSA[14]	2009	<ul style="list-style-type: none"> • Dynamic node selection • Better than Leach in terms of energy consumption 	<ul style="list-style-type: none"> • Complex in nature • Lifetime can be further improved 	Better as compared to LEECH
Secure and reliable Routing protocol	2007	<ul style="list-style-type: none"> • Cluster head formed are heterogeneous • Variable sized clusters 	<ul style="list-style-type: none"> • Limited Implementation framework • Residual energy is low. 	Commonly used protocol in unequal cluster sized environment
CCS[37]	2007	<ul style="list-style-type: none"> • Least Energy Consumption • Packet drop ratio decreases 	<ul style="list-style-type: none"> • Asymmetric Energy Consumption • Time duration is high 	It is network coding based protocol for energy efficiency

From comparison table it is concluded that techniques associated with clustering algorithm within WSN requires considerable improvement in terms of energy conservation and packet drop ratio. Distance handling among WSN is critical for this purpose.

5. RESEARCH GAPS

Energy conservation is one of the prime issues associated with existing clustering protocols. Cluster head selection causes huge amount of energy to be consumed. In case cluster head selected is not optimal, it may cause large amount of packets to be lost. The packet drop ratio is another parameter which is critical in analysis of performance of clustering algorithm. Distance consideration is missing or shortest path algorithm is not considered causing degradation of performance in existing system. To overcome the problems of existing system distance based approach in DEEC can be proposed. Problems in existing literature are listed as follows

- 1.5 Energy conservation is high
- 1.6 Packet drop ratio is high
- 1.7 Residual energy is low
- 1.8 Distance based mechanism is not considered

6. CONCLUSION AND FUTURE SCOPE

This paper presents comprehensive survey of techniques used within WSN to achieve increase in lifetime of sensor within WSN. Critical analysis of various efficient protocols used in WSN has been reviewed Enhancement in lifetime involves mechanism such as sleep and wake up protocol but has demerits associated with it. The idle nodes are considered to be sleep and in results there is breakage in functioning of topology. In order to restore the nodes to their initial state sufficient energy is required leading to loss of packets. Secondly the distance conservation mechanism is not considered in DEEC protocol which results in high packet drop ratio. In case of leach aggregation the cluster head causes problem because if cluster head is dead then all packets collected at cluster head are lost automatically. From analysis of existing techniques it is identified that there exist a tradeoff between energy and packet drop

ratio. In future this tradeoff between energy and packet drop ratio is to be eliminated by considering distance between nodes before selection of cluster head or by making more than one cluster head. Use of priority queue can also be merged within existing approach for enhancing performance of WSN.

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