A Survey on comparison of various Energy efficient schemes in Wireless Sensor Networks

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Abstract: The Wireless Sensor Network (WSN) is a wireless network consisting of small nodes with sensing, computing and wireless communication capabilities. WSN are generally used to supervise actions and report measures, in a specific area or environment. It transmits data back to the Base Station (BS). Data communication is usually number of hops from node to node in the direction of the BS. Sensor nodes are limited in power, computational and communication bandwidth. The Main goal of researchers is to find the efficient routing protocol which consumes less energy. This survey details about the various routing protocols with merits and demerits.

Keywords: Energy Utilization, data aggregation, topology management, throughput, Network lifetime.

I. Introduction

In wireless sensor networks, information is gathered through the sensing nodes and these sensors have the ability to exchange information across the nodes of the WSN or with base station. Usually WSNs will be constructed in such a way to utilize the energy optimally. Even though it is the case, the WSNs consume more energy as the nodes need to gather the information and have to send all over the network endlessly [1]. In fact in WSN the nodes will do many tasks like area sensing, data processing, endless data communication etc. all these demand more energy but nodes provided with inadequate energy. With this constraint energy management in WSN plays a vital role.

One of the procedures, to save the energy consuming is clustering sensor nodes [2–3]. In this process, nodes are structured into dissimilar groups, called clusters and each cluster group has a manager referred as head of the cluster and remaining nodes within a group act as members of the Cluster. Nodes send the data to their respective Head of the Clusters. Then it collective them and send to the destination.

In the subsequent section, we discussed the energy efficient protocols Clustering Based Technique, Low Energy Adaptive Clustering Hierarchy (LEACH), V-Leach Protocol, K-means Clustering and Chain Based Routing Protocol (H-IECBR).

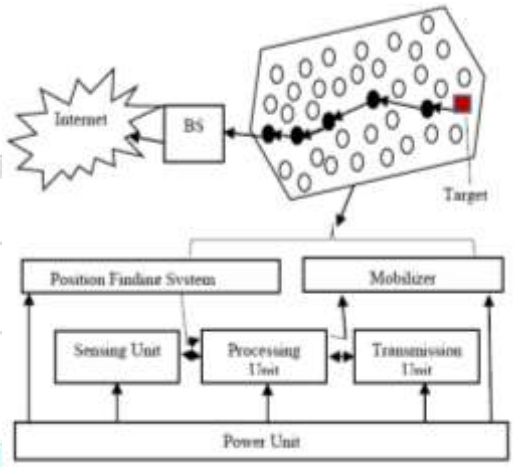

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Fig1: Structure of WSN and Node Components

II. Survey on Energy Efficient routing protocols on WSN

A. Energy efficient in WSN-Clustering Based Technique

Clustering the nodes [4], which segregates the total network into two sub-areas, and the nodes on the identical sub-area grouped to the same cluster. For efficient allocation of grouping, we will select Cluster Heads.

In WSN, overwhelming of data provided by sensor nodes, the Clustering technique links the data and then grouping the data, resulting more energy consumption. The Cluster Head plays a major role for getting the data from different nodes and combining and transmitting to the Central administrated node.

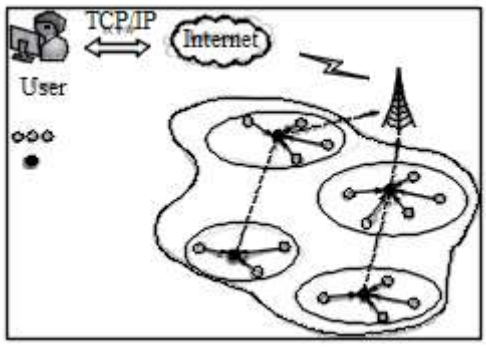

Fig 2:A classic clustered sensor network

The Survey classifies the different clustering techniques based on the input of the Cluster Head Selection and its execution.

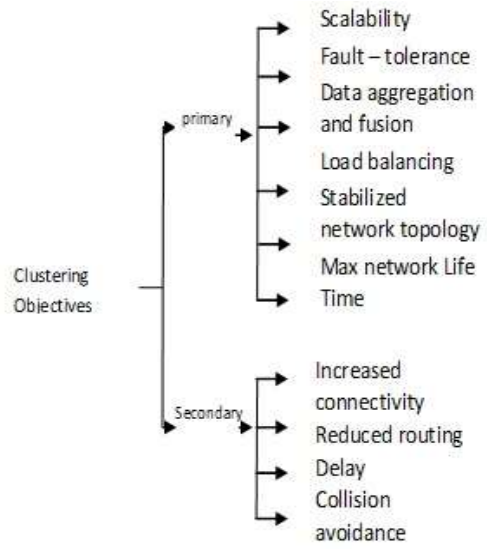

Fig 3:Clustering goals

B. **Low Energy Adaptive Clustering Hierarchy (LEACH)**

In this Survey[5],LEACH incorporates a new, dispersed cluster creation procedure which will provide more amount of nodes, movement of Cluster Head Position to equally to assign the energy weight to every one of the nodes. It gives application-specific information accumulation to achieve great execution as far as framework life range, dormancy, and application-saw quality.

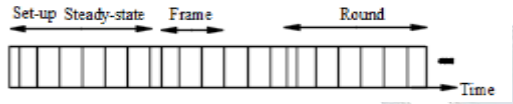

Fig.4.Time Line Diagram

The Diagram shows Groups created in set up phase and data send at steady state phase

LEACH, a popular cluster base protocol, there every node will be elected as a cluster head once in a while [6][7][8].A LEACH function with many enumerations .i.e the execution process in this protocol contains many enumerations. Each enumeration includes these steps 1. Setup 2. Steady data transmission [9] in step1, one among the all will be elected as cluster head(CH) and many clusters are formed instantly. In step 2, the CH collects the information from all element nodes of cluster, performs the compression of data and sends it to the sink node.

Practices employed by the **LEACH** to meet the design goals[5]stated:

- arbitrary, versatile, autonomous group development
- localized control for information exchanges
- low-vitality media get to control
- Application-particular information handling, i.e data gathering

C. Energy Efficient Technique in WSN by V-Leach Protocol

In this technique [10], election process of primary head and secondary head of the cluster was mentioned and energy efficient routing using particle swarm optimization (PSO)method and V-LEACH protocol was formulated. When compared to the previous Leach protocols, it provides good Performance and taking low energy for sending the data and improves life time of WSN's.

One node will be considered as a head of the cluster among the group of nodes. it collects the data from others and sending data to others. so it loses more energy. To improve the lifespan of the cluster Head, when the primary head, the secondary head will take the authority for the data transmitting.

D. H-IECBR: HBO based-Improved Energy Efficient Chain Based Routing Protocol in WSN

HBO[11] is a bio inspired model and of the chain based routing protocols[12,13,14],it is developed by observing an activity. i.e where one honey bee went out and collects the food and calculates the nutrition levels in the food if the level is up to the mark that information is passed to the other bees. i.e in this model the parameter nutrition levels in the food given high priority than others like how far the food is and how much energy was spent, likewise in HBO given high priority for the sensed data quality than others like energy and distance.

H-IECBR build the chain on the basis of HBO.

E. Energy Efficient K-means Clustering-based Routing Protocol for WSN Using Optimal Packet Size

In this [15], cluster will be formed using K-means clustering by considering rigid packet size as a influenced parameter in the election of CH. In this technique, each node will take less energy and improves lifespan of the network.

It includes 3 stages

A. Initialization stage

In which Central administrated node will broadcast the data over network. After getting the data, sensors will reply to the Central administrated node. With the reply from the nodes CA node comes to the respective locations [8] of the nodes.

B. Cluster Formation Stage

- This technique distributes the data set into no of clusters.(i.e. N=K)

- Evaluate the distance between each node to each of the cluster centers.

C. Cluster Head Selection Stage

This step will take care of the formation of the clusters. After that, Cluster Head will found, then this message will be broadcasted over the network and nodes will update routing tables accordingly.

Table 1. A comparison of various Energy efficient schemes

S.no	Reference	Scheme	Metrics	Advantages	Disadvantages
1	M. Mehdi Afsar,Mohammad-H. Tayarani-N[4]	Clustering Technique	fuzzy-logic and, heuristic-based	Less Energy Utilization, fault tolerance, and topology management. In hierarchical clustering, the Cluster Heads share the executing tasks.	if any node fails, the procedure to form the clustering has to be repeated. So lot of energy wasted.
2	Wendi B.Heinzelman, AnanthaP.Chandrakasan[5]	LEACH	Application specific data aggregation	Improved lifespan of the system. Reduced latency, Application perceived quality	When Head of the cluster dies, the data collected by the nodes would never reach its destination.
3	Alka Singh, ShubhangiRathkanthiwar and Sandeep Kakde[10]	V-LEACH	PSO Technique	End to End delay, data transmission , total energy utilized and better performance	V-LEACH has no solution when vice cluster head dies.
4	AmanGupta,Abhishek ,Hardeep Singh saini,RajeshKumar,Naveen Kumar[11]	H-IECBR	HBO Technique	Improves lifespan of the system, when first node dead. Improves Network lifetime	More Data packets will be generated in the cluster formation process.
5	MadihaRazzaq, Devarani Devi Ningombam, Seokjoo Shin[15]	KEAC	K-Cluster Technique	Network lifespan and enhances efficiency of the network.	Difficult to estimate the no of clusters (K-Value). primary seeds have a Great influence on the final results

III. Conclusion

In Wireless Sensor Networks (WSNs), Energy saving of a node feature to be addressed, when a node has to send the data to other node it consumes lot of energy. Hence the recent research focused on Energy efficient management techniques to save the energy of the node individually and total network as a whole. In this paper, we discussed different recent Energy efficient techniques in WSNs. We did comparative study (in tabular form) of different Energy Consumption methods by highlighting their merits and demerits.

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