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Cluster Based Routing Protocols for Target Tracking In WSN: A Survey

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Abstract— Wireless Sensor Network applications are attracting more and more research, especially in energy saving techniques that is the focus point of researchers in this area. One of the interesting and useful applications of Wireless Sensor Networks is the moveable target tracking. Wireless Sensor Networks that is used mainly to track movable targets in a monitored area and to report its location to the base station. Identification of exact position and path travelled by the movable object in an area is a major energy consumer process within Wireless Sensor Network. In this paper, we suggest a best cluster based routing protocol called *energy efficient target tracking protocol* (EETTP) for target tracking in Wireless Sensor Networks (WSNs), with the help of this protocol increase network lifetime of every node and reduce communication cost between nodes. Which integrates on-demand dynamic clustering into a cluster-based WSN for target tracking? By constructing on-demand dynamic clusters at boundary regions, nodes from different static clusters that detect the target can temporarily share information, and the tracking task can be handed over smoothly from one static cluster to another. As the target moves, static clusters and on-demand dynamic clusters alternately manage the target tracking task. The proposed protocol performs better in tracking the moving target when compared with other typical target tracking protocols. In particular, we systematically analyse a few important parameters of the cluster based routing protocols, and compare with these different approaches according to our taxonomy such as energy efficiency, communication cost. Finally, we summarize and conclude the paper with some future directions.

Keywords— WSN; target tracking; cluster; cluster head; boundary nodes; energy efficiency; static cluster; nodes; communication coast.

1. INTRODUCTION

Target tracking is considered important in WSNs, as it is a base for many practical applications, such as battlefield surveillance, emergency rescue, disaster response, and patient monitoring. Generally speaking, target tracking aims to detect the presence of a target and compute reliable estimates of its locations, while the target moves within an area of interest and forward these estimates to the base station in a timely manner.

Target tracking is believe to be as almost demanding applications in WSN because of application requirement that place a heavy burden on the network resources, such as it is energy consumption and communication cost between nodes. The main task of target tracking is identification of exact position and path travelled by the movable object reports to the base station, for this task wireless sensor network requires much more energy. Because of this reason it is necessary to develop energy efficient techniques that the application requirements of a target tracking system that reduce the total energy consumption and communication cost of the wireless sensor network.

Identification of exact position and path travelled by moveable object in an area uses the stable cluster for the network scalability and energy consumption. It uses a predictive mechanism to communicate with CH about the detecting the target to a node, and then the coherent cluster node send a message about the target to number of suitable neighbor nodes right before the arrival of the movable target. This problem can be solved as the target tracking task and transfer from one stable cluster to another stable clustering process. Therefore, stable cluster-based method is more appropriate for moveable target tracking in wireless sensor network. In any case, the static group nodes keep sensors in distinctive clusters from conveying and imparting their data to one another, which causes a boundary issue when the target moves crosswise over or along the boundaries of one cluster to another cluster. The boundary issue will bring about the increment of following vulnerability or the loss of the movable target.Therefore, a better protocol is required to solve the boundary problem, to decrease the use of node energy, decrease computation time of the node and local sensor communication in cluster based sensor networks. Several methods have been proposed in the outfit for information retrieval from sensor node in WSN.

2. RELATED WORK:

2.1. Techniques for target tracking in WSN:

In customary target tracking framework make utilization of unified approach in WSN. As the numerous sensor nodes are active in the system, more messages are forward towards the base station devours extra transmission capacity and energy. Hence, this methodology

is not blame tolerant as there is a solitary purpose of disappointment and needs adaptability. Also in conventional target following routines, a detecting undertaking is normally done by a node at once bringing about less precision and overwhelming reckoning weight on that node. In WSN every node has restricted energy; consequently traditional tracking methods based on complex signal processing algorithms are not useful [1].

To enhance the nature of target tracking, sensors need to make precise conjecture of the location of target. The imperative components of the WSN are versatility to expansive size of node arrangement, capacity to withstand intolerable ecological conditions, convenience and energy utilization. Target tracking application is cluster based, tree-based, and hybrid based strategies. In an target tracking application the sensor nodes that can sense the objective at a predetermined time are kept in active mode yet the remaining nodes are to be kept in rest mode, spared vitality until the objective reaches inside of their detecting range. The objective following assignment keeping up the harmony between system assets, for example, energy and data transfer capacity. In tree-based target tracking the nodes that distinguish the objective speaks with one another and chooses a root node. The root node gathers data from the entire node by means of a spanning tree. In the event that the root node is far from the objective, then the tree is reshaped. We require more exact target tracking in spanning tree-based methodologies, tree associations bring about high energy utilization. Hybrid techniques are the following calculations that perform the prerequisites of more than one sort of target tracking. In cluster based systems, nodes are either named group individuals or cluster heads. In cluster based target tracking, nodes identify the objective and send the data to their cluster head. Cluster heads gather all data from their cluster node and appraisal the position of the objective by utilizing confinement methods. After the position of the objective is figured, cluster head sends the position data to the sink. In the cluster based methodology, the essential advantages is the diminishing the energy utilization amid target tracking assignment.

2.2. Clustering :

So as to support preparing of information onto energy efficient network, sensor nodes can be separated into various little groups called clusters. The sensor nodes total into groups is called clustering. Each cluster has a solitary cluster head (CH). A cluster head is chosen from the sensor nodes with greatest remaining battery power and correspondence range. There are a few focal points of clustering the marvel. The essential favourable position is that, it backings system adaptability. That can likewise safeguard correspondence transfer speed. Clustering process can make stable WSN network topology at the level of sensor nodes network. The CH is likewise executing powerful administration procedures to extend the battery life of the individual sensors and to amplify the network lifetime. Every node, that works in three states. In the active state, that transmits bundles, get parcels, and sense the target. In Sensing state, that node performs a detecting operation. And in the sleep state, it sleeps for most of time and wakes up when it sense the target and listen to the message from another node. Since communication operations dominate the energy consumption, we mainly concentrate on energy consumption required for communication. The sensor nodes with the maximum residual energy is elected as the cluster head (CH) to take charge of signal processing from node CH. Fig.1 shows the basic clustering concept. The clustered sensor nodes detecting target & transfer their observations to the CH. The cluster head further process the information and transfer to the sink, referred to as the base station. Cluster-based target tracking approaches are classified into two types, such as static approach and dynamic approaches.

2.2.1. Benefits of clustering:

1. Provides useful energy consumption.
2. Provides scalability for large number of nodes.
3. Reduces communication overhead using prediction.

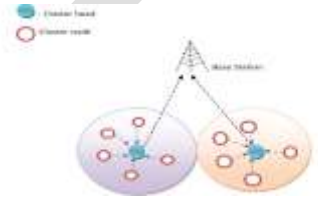

Fig 1: Clustering of sensors in network.

2.3. Classification Of Cluster based Target Tracking Methods:

WSN can be principally having two standard groupings, Hierarchal and matched frameworks. The hierarchal framework is a mesh based structure having multi bounce system among nodes that are passed on. The sensors that screen the goal and report back to the base station through cluster head. The hierarchal system is assembled into three essential orders exhibited in Fig. 2, Tree based, Cluster based and Hybrid based systems. Here in this paper we identify with review on the cluster based frameworks. The cluster based strategies can be again isolated into static cluster system and dynamic cluster approach [5].

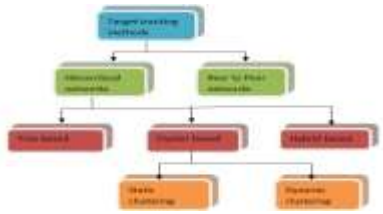

Fig 2: Classification Target Tracking Methods.

2.3.1. Static Cluster Based Target Tracking:

In static cluster based target tracking, at the time of network deployment stable clusters are generated. The clustering nodes and cluster head are characterized stable before and after target tracking. However, the static clustering has some drawbacks in spite of its simplicity. It is not robust because of its fixed clusters and cluster head. If the cluster head dies because of power depletion then the cluster provide uselessly. Because of the static cluster the sensor nodes from another cluster cannot share data and collaborate on data processing [5].

2.3.2. Dynamic Cluster Based Target Tracking:

In dynamic clustering sensor nodes that shape diverse cluster at distinctive times as per the movement of the objective as likes LEACH. Those nodes are the individuals from distinctive clusters at an alternate time and it minimizes the restriction mistake produced by that WSN network. Stand out cluster is in active state at every time as indicated by target movement in the WSN network. Hence, it decreases the energy utilization of sensors in the group. Dynamic clustering methodology is more protected and dependable than static grouping methodology. Likewise, the sensor hubs detecting and sending repetitive data has been decreased.

Parameters	Static Clustering	Dynamic Clustering
Localization error	Maximum	Minimum
Cluster head selection	Statically defined	Maximum residual energy
Cluster formation	Simple	Complex
Energy consumption	Low	High

Table1: Comparison of static and dynamic clustering

We have several methods in survey on cluster based target tracking in WSN to collect information from the WSN such as LEACH, HEED, TEEN, AFTEEN and HCTT. Here in this paper, I explain existing cluster based target tracking techniques with their advantages and disadvantages in this following part.

2.4. Low-Energy Adaptive Clustering Hierarchy (LEACH):

It is a cluster-based energy efficient routing protocol for a target tracking in wireless sensor network. LEACH consists of two working phases during network establishment. In the first set-up phase, sensor nodes select a local cluster head randomly among themselves, that the network may balance energy over consumption across the complete network. After the cluster head selection process, each cluster head broadcast their node id to all sensor nodes that these are the new cluster heads. Once the nodes receive the advertisement message from cluster head, each of them decides to which head it belongs to. In Second steady state phase, every sensor node sense and transmit data to the sink through their cluster head. After some period of time, the network again restarts the set-up phase. LEACH adopts multiple hops to communicate with node to base station, which makes it more practical than direct communication method. Besides, it is the assumption that all nodes have enough energy to communicate directly with the base station makes it difficult to apply in a large-scale network [2][3][8]. It is one of the limitations of LEACH when we used to track the movable target in large scale wireless sensor network.

2.5. Hybrid, Energy-Efficient Distributed Clustering (HEED):

HEED is believed to be as energy-efficient clustering algorithms that use the rest energy of the node to select the Cluster Heads (CHs). It is an updated version of LEACH routing protocol that considers residual energy and communication range as a selection criteria of the cluster head. The result of the HEED routing protocol is establish with better energy efficiency even as compare to LEACH, with

the better increasingthe network lifetime of WSN node. It uses residual energy as primary parameter. In this, all nodes are considered to be homogeneous i.e. all sensor nodes are deployed with same opening energy. As the lifetime of the sensor network is finite, there is need to re-energize the sensor network by adding more sensor nodes. These nodes will be furnished with more energy than the nodes that are already in use, which creates heterogeneity in terms of node energy [6][7][8][15].

2.5.1. The advantages of the HEED protocol [8]:

(1) It is superbly circulated clustering technique that advantages from the utilization of the two extensive constituents for CH determination, for example, node energy and correspondence range.
(2) Low power levels of cluster promote a development in spatial reuse while high power levels of cluster are important to use for middle cluster correspondence. This CH gives uniform dispersion past the system and equalizations the heap.
(3) Communications in a multi-hop trend between CHs and the BS warns more energy promotion and enhancement in difference with the single-hop trend, i.e., long-range communications directly from CHs to the sink, in the LEACH protocol.
Communications in a multi-hop pattern in the middle of CHs and the BS cautions more energy advancement and improvement in distinction with the single-hop pattern, i.e., long-run correspondences straightforwardly from CHs to the sink, in the LEACH convention.

2.5.2. Limitations with HEED [8]:

(1) The utilization of makeshift CHs that don't be extreme CHs abandons some uncovered nodes. As indicated by HEED execution, these nodes are considered to turn into a CH and these considered CHs may be in scope of different CHs or might not have any part connected with them. Therefore a bigger number of CHs are produced than the normal number and this likewise represents disequilibrium low energy drift in the system[9].
(2) Similar to LEACH, the work of cluster in every round forces critical measure of energy utilization in diminishing the network life time.
(3) HEED experiences a subsequent overhead since it needs a few reiterations to generate clusters. At every reiteration, considerable measures of parcels are telecast.
(4) Some CHs, particularly close to the sink, may kick the bucket prior on the grounds that these CHs have most extreme work load.

2.6. Threshold sensitive Energy Efficient sensor Network protocol (TEEN) :

TEEN [10] is a various levelled protocol whose primary target is to adapt to sudden changes in the detected properties, for example, spot of the objective. The convention consolidates the various levelled technique in accordance with an information driven viewpoint. The nodes sense their surroundings reliably, yet the energy utilization in this calculation can likely be substantially less than that in the proactive network, in light of the fact that information transmission is done less over and over.
TEEN uses a 2-level clustering topology is having two threshold values, hard threshold and delicate threshold. The prior threshold is starting limit esteem for the detected attribute. It is the ideal worth, past which the node detecting this quality must switch on its transmitter to transmit detected credits and report to its CH. The recent edge is a little contrast in the detected worth which begins the node transmitter and transmits that esteem to another hub.
In TEEN, a CH transmits its introductory qualities a hard limit and delicate edge to the nodes. Therefore the hard threshold tries to straightforwardness information correspondences by permit the node to transmit just when the detected worth is in the middle of hard and delicate limit esteem. The delicate threshold diminishes information interchanges when there is little or no adjustment in the detected worth. At the expense of expanded energy use, a littler estimation of the delicate threshold removes more correct data of the system. Consequently clients can deal with trade-off between energy proficiency and information. Besides, the delicate threshold can be differed and the clients can change the new parameters as needed at each group era time.

2.6.1. Advantages of TEEN:

(1) Based on the two threshold values, information transmission can be controlled excellently, i.e., just the sensitive information can be send to BS, so it lessens the energy needed for transmission and enhances the viability and ease of use of the accepting information.
(2) It supplements for vast changes in the sensed properties, which is suitable for time discriminating applications.

2.6.2. Drawbacks of TEEN:

1) It is not suitable for repeatable time discriminating applications since the client may not get any information at all if the estimations of the characteristics may not achieve the limit [11].
(2) TEEN has squandered time-slots and a plausibility that the BS will be unable to separate terminated nodes from live nodes, on the grounds that just when the information touch base at the hard threshold and has a variation higher than the delicate limit did the sensors reports the information to the BS.
(3) If CHs are not in the scope of one another the information may be lost, in light of the fact that data television is accomplished just by CHs [12].

2.7. Adaptive Threshold sensitive Energy Efficient sensor Network protocol:

The Adaptive Threshold sensitive energy efficient sensor network convention (APTEEN)[13], is an upgraded form of TEEN and goes for both transmitting time basic data and responding to time discriminating occasions. Then again, It is a hybrid protocol that progressions the periodicity or edge qualities utilized as a part of TEEN by prerequisite of user and the sort of the application. APTEEN is taking into account a query framework which has diverse sorts of queries, for example, verifiable, on-time, and steady which can be utilized as a part of a hybrid network.

All nodes sense the environment continuously, however just those nodes which sense an information esteem at or past the hard threshold endures transmitting. In the event that a node does not send information for a period equivalent to the tally time, it must sense and transmit the information once more. In APTEEN, each CH gathers the data from the node inside of its cluster and transmits the collected data to the BS. Amid the procedure of information accumulation, it is expected that the information got from the comparing node are connected, consequently it lessens a lot of repetition of the information to be send to the BS. Besides, an altered TDMA calendar is utilized to actualize the mixture arrange by relegating every node in the group a transmission opening. Moreover, APTEEN offers a ton of adaptability by permitting the client to set the CT interim and the limit values for vitality utilization can be controlled by changing the CT and in addition the threshold values.

2.7.1. Advantages of APTEEN:

(1) Based on the two edge values, information transmission can be controlled estimably, i.e., just the delicate information can be send to BS, with the goal that it diminishes the energy needed for transmission and enhances the viability and ease of use of the accepting information.

(2) It supplements for huge changes in the detected traits, which is suitable for time discriminating applications.

2.7.2. The main disadvantages of APTEEN are as follows:

(1) There exist additional complexity required to implement the threshold value and the count time.

(2) Actually, TEEN and APTEEN has similar drawbacks of additional overhead and complexity of cluster building in several levels, implementing threshold value based functions, and dealing with attribute based naming of queries [14].

2.8. Hybrid cluster-based target tracking (HCTT):

The objective following [16, 17, and 18] uses the steady cluster for the system versatility and energy efficiency. (The term of "stable cluster" does not imply that the cluster won't adjust amid the network lifetime. It implies that the cluster structure will keep unaltered for a moderately long time contrasted with a transiently created dynamic cluster, until the following round of grouping procedure begins. Along these lines, at this very moment the LEACH convention [19], every sensor nodes has the likelihood of turning into a cluster head to adjust the vitality load). It utilizes a prescient instrument to inform cluster heads about the hitting the objective and afterward the comparing cluster head awakens number of fitting nodes just before the entry of the objective. This work can be saved as the tracking task is handed over from one stable cluster to another without costly dynamic clustering processes. It likewise gives a versatile structure to facilitating and managing networks.Along these lines, stable cluster based methodologies are more suitable for target following in huge scale sensor network. In any case, the steady cluster enrolment stops sensors in distinctive groups from offering data to one another, which raises a boundary issue when the objective moves crosswise over or along the boundary of clusters. The boundary issue will bring about the increment of following incertitude or loss of the objective. In this way, another convention is important to take care of the boundary issue and understand the bargain between energy utilization and nearby sensor cooperation for cluster based sensor network.

ZhiboWang, Wei Lou, JunchaoMa, and Honglong Chen propose a hybrid cluster-based target tracking (HCTT) [4], for efficient target tracking in a large-scale cluster-based WSN. HCTT amalgamate on-demand dynamic clustering into a scalable cluster based WSN with the help of boundary nodes, which convenience sensor co-operation in clusters to find the solution to boundary problem. As shown in Figure 1**,**at the point when the objective is inside a static cluster, the cluster is skilled to track the objective; at this very moment moves close to the boundaries of cluster, an on-interest dynamic clustering procedure will be begin to deal with the following assignment to dodge the boundary issue. The on-demand dynamic cluster will stop rapidly after the objective moves separated from the boundaries. At the point when the objective moves, static clusters and on-demand dynamic clusters alternately manage the tracking task. By aggregate on-demand dynamic clusters into an adaptable cluster based structure, nodes fitting in with diverse static cluster can share data, which ensures effectively target following and clear up well bargain between energy utilization and nearby sensor co-operation.

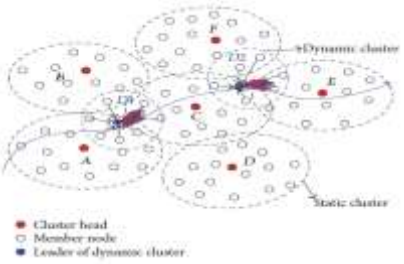

Figure 1: HCTT for target tracking in a cluster-based WSN.

2.8.1. *Advantage:*

With reference to above (3.5) HCTT has benefit over the LEACH, HEED, TEEN and AFTEEN protocol, it avoids boundary problem, transfer target smoothly from one static cluster to another cluster.

2.8.2. *Disadvantage:*

As per above discussion it has limitation about energy consumption. HCTT requires more energy in boundary region nodes for on demand cluster generation process.

3. PRAPOSED WORK:

In this paper, I speak to the suitable energy efficient protocol for target tracking and it is an enhanced form of LEACH, HEED, TEEN, AFTEEN and HCTT. With the assistance of proposed routing protocol increase the system lifetime of the each node and diminish correspondence overhead between two nodes.

3.1. Energy Efficient Target Tracking Protocol (EETTP):

In this section we propose an energy efficient target tracking protocol for wireless sensor network. With the help of this protocol we reduce energy usage using clustering algorithm and reduce communication cost. Work flow consists of a main task called cluster generation, boundary node formation, target tracking task.

3.1.1. Cluster Generation:

So as to support preparing of information onto energy efficient network, sensor nodes can be separated into various little groups called clusters. The sensor nodes total into groups is called clustering. Each cluster has a solitary cluster head (CH). A cluster head is chosen from the sensor nodes with greatest remaining battery power and correspondence range. In cluster based systems, clusters are identified using cluster heads. Clustering process can make stable WSN network topology at the level of sensor nodes network. The CH is likewise executing powerful administration procedures to extend the battery life of the individual sensors and to amplify the network lifetime.
In clustering process we consider parameters such as node energy (N_{TE}), communication range (R_N) of every node and time slot (T_s) of each and every node participated in cluster generation process. Each cluster within WSN consists of cluster head (CH_{Id}). In cluster formation first task is cluster head selection. In that process every node sends its node ID (N_{Id}), communication range (R_N) and node total energy (N_{TE}) to all neighbour node which are present in communication range. Every node compares his own communication range and node total energy with received parameters from his neighbour. If received communication range and node total energy greater than that node again broadcast his node ID as a cluster head (CH_{Id}) to its entire neighbour node otherwise it does not send any message to neighbour. Every node consist information in his buffer such as node ID, cluster head ID, communication range, node total energy along with its neighbour node information.

3.1.2. Internal Node/Boundary Node Formation:

At the point when following an target in a checking territory, number of nodes around the target co-work with one another to make the gathered data more complete, and exact. At the point when the target is inside a cluster, as every enacted sensor fit in with the same cluster, and they can correspond successfully with one another. Then again, when the target moves towards the boundaries of numerous clusters, the boundary issue happens. That is, the neighbourhood node co-operation gets to be inadequate and flawed on the grounds that sensor hubs that can screen the objective have a place with different cluster, which builds the vulnerability of the limitation of the objective or even results in the loss of the versatile focus because of the deficient detecting reports to the neighbour nodes and base station.
In a static cluster, a node is interprets as an internal node of its static cluster that means it does not have any information of node which belongs to another cluster. As each node is feel his own location and its neighbour information. Neighbour information consists N_{Id}, N_{TE}, R_N and CH_{Id} . It checks its neighbour list to determine whether a node is from another cluster within its sensing range. If obtained a neighbour node id with different cluster head, then it is a boundary node else it is as an internal node.

Definition 1.Boundary node of a static cluster

A node $V_i$is defined as a boundary node of its static cluster if there exists at least one of its neighbour nodes V_j, such that $(l_i, l_j) \leq r_s$and $(V_i) \neq C(V_j)$.

Interestingly, a node is characterized as an inside node of its static cluster on the off chance that it is not a boundary node. As every node is mindful of its own location and its neighbour data, it checks its neighbour rundown to figure out if there exists a node fitting in with another cluster inside of its detecting range. In the event that yes, it is a boundary node else, it is an inside node.

3.1.3. Target Tracking Task:

After all nodes deployed over an area, sensor nodes are organized into static clusters according to clustering algorithm such as HCTT. Each and every node works in two states active state, sleep state. In active state node is responsible to sense the target, send the message about target to the neighbour node, and cluster head. In sleep state node is only responsible to receive the message form neighbour. When the sleep state node receive message about target approaches in his neighbour node range that means it change its state from sleep to active state.

When the target is in the network, static cluster nodes sense the target. Static cluster nodes will send target ID, node id, time, cluster head id to neighbour node and cluster head, Wakes up neighbour node to track the target. When neighbour node receive message from his neighbour node, that node firstly check his buffered neighbour information, change its state from sleep state to active state and it is ready to track the target. This whole process requires more communication cost and it consumes energy of the node because continues monitoring and broadcasting and receiving nature. For reducing communication cost we use prediction method such as like TEEN and AFTEEN protocol.

In energy efficient routing protocol whenever node detects the target at that time node stores that value as limit value. This value consist attributes such as target id, node id, cluster head id and time (T_{id}, N_{id}, CH_{id}, T_s respectively). When node monitors target continuously, simultaneously in back end monitoring node compare his historical limit value with the new value. If node obtains different node id, with new time slot then broadcast that new values to the neighbour nodes and cluster head and that value is considered as a new limit value. Otherwise that node will not make any communication with neighbour and cluster head. In this way with the help of energy efficient routing protocol we reduce communication cost.

In second case, when target reach in boundary region. Boundary nodes in that region can detect the target and that node smoothly tracking the target because that node is responsible to communicate with boundary nodes of another cluster and with static nodes in his cluster. As the target moves across the boundaries, static clusters and boundary nodes are alternately manage the tracking task.

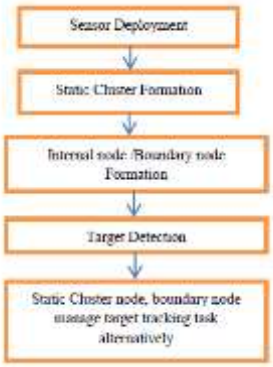

Fig 3. system workflow for energy efficient routing protocol

In grouping topology is manufactured as limit value, it is the introductory detected estimation of node. The edge is limit esteem for the detected quality. It is indisputably the estimation of the property past which, the node detecting this worth must switch on its transmitter and report to its CH. With the assistance of that we lessen correspondence cost between cluster head and target following node.

4. DISCUSSION:

From the above theory we observe that EETTP is more energy efficient algorithm for target tracking as compared to LEACH, HEED, TEEN, AFTEEEN, and HCTT. EETTP algorithm is more energy efficient because of the following reason.

1. LEACH, HEED, TEEN, AFTEEEN are requires more energy because cluster and cluster head selection process are implemented repeatedly in WSN. Whereas in EETTP cluster and cluster head selection process implemented only once. But this protocol is also implemented dynamic behaviour of cluster because if cluster head feels its total battery life is less than other nodes in cluster, then at that time cluster head selection process is again implemented by WSN network. That is one of the main reasons to require minimum energy for the EETTP to track the target.
2. LEACH, HEED requires more communication cost as compared to the TEEN, AFTEEN, and EETTP. Because in this protocol we consider threshold values such as past sensed value is compare with current values if that values are differed then and then communicate with cluster head and neighbour nodes.
3. Most important point regarding efficient and accurate target positioning task in WSN is implemented in HCTT and EETTP. When target move from one cluster region to another new cluster region at that time target is not tracked with the help of LEACH, TEEN etc. Because in these protocol there is not provision made for proper communication possible between two clusters, but it is possible in HCTT and EETTP. In HCTT, EETTP we create boundary nodes during cluster generation process, these nodes are responsible to make communication between two clusters inform exact position of the target to base station.

According to following comparison table EETTP is energy efficient for target tracking in WSN with minimum communication cost and track exact position of the target at given time.

Table 2: Comparison of the clustering algorithms.

Clustering Approach	Boundary Node Formation	Power Usage	Inter cluster connectivity	Communication cost	Target Detection accuracy
LEACH	No	Maximum	1-hope	Maximum	Moderate
HEED	No	Maximum	1-hope	Maximum	Moderate
TEEN	No	Moderate	1-hope	Moderate	Moderate
AFTEEN	No	Moderate	1-hope	Moderate	Moderate
HCTT	Yes	Moderate	1-hope	Maximum	Maximum
EETTP	Yes	Minimum	1-hope	Minimum	Maximum

5. CONCLUSION:

Network lifetime is the most important parameter in comparison of majority of WSN's applications such as target tracking using WSN. One of the main limitations of WSN is the limited power of sensor nodes. This limitation affords that saving energy and increasing network lifetime become two main issues in WSN's applications. In this paper we presented an cluster based Energy Efficient Target tracking protocol for reducing energy consumption and communication cost for target tracking in WSNs respectively. With the help of EETTP we solve boundary problem when we use more than one cluster in a WSN. Our proposed protocol considers both energy and communication range parameters for clustering. This method could be considered for improvement of LEACH, HEED, TEEN and AFTEEN protocols. In the future, the methods should be extended to track multiple moveable targets track in wireless sensor networks.

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