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Enhanced multi-objective Fuzzy Clustering base protocol for 3D WSNs

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ABSTRACT:- The gathering of various population based on factors such as economics or religion. Cluster is a technique to join many networks. The multi-objective fuzzy clustering algorithm has the ability to address both hotspot and energy hole problem in station and evolving networks which has no fix structure although fuzzy clustering has shown better results than traditional protocol but it has not considered the use of multiple sinks as well as 3D wireless sensor network. As multiple sink and 3D based network has become very popular so that main objective of this paper is to explore the benefits of multi-objective fuzzy clustering algorithm for multiple sink and 3D wireless sensor.

KEYWORDS:- WSNs, FUZZY CLUSTERING

INTRODUCTION

A WSN typically has minimum infrastructure. It consists of several sensor nodes (few tens to thousands) working together to monitor an area to acquire data in regards to the environment. There are two kinds of WSNs: structured and unstructured. An unstructured WSN is one which has a dense assortment of sensor nodes. Sensor nodes may be deployed in an ad hoc manner[2] into the field. Once deployed, the network is left unattended to execute monitoring and reporting functions. In a unstructured WSN, network maintenance such as for example managing connectivity and detecting failures is difficult since there are so many nodes. In a structured WSN, all or a number of the sensor nodes are deployed in a pre-planned manner.[3] The advantage of a structured network is that fewer nodes could be deployed with lower network maintenance and management cost. Fewer nodes could be deployed now since nodes are placed at specific locations to offer coverage while ad hoc deployment can have uncovered regions. WSN has its own design and resource constraints. Resource constraints incorporate a limited level of energy, short communication range, low bandwidth, and limited processing and storage in each node. Design constraints are application dependent and are on the basis of the monitored environment. The surroundings plays a vital role in determining how big the network, the deployment scheme, and the network topology. How big the network varies with the monitored environment. For indoor environments, fewer nodes are needed to form a network in a limited space whereas outdoor environments may require more nodes to cover a bigger area. An offer hoc deployment is preferred over pre-planned deployment when the surroundings is inaccessible by humans or once the network consists of hundreds to tens of thousands of nodes. Obstructions in the surroundings also can limit communication between nodes, which in turn affects the network connectivity (or topology).

FUZZY CLUSTERING

fuzzy clustering is a kind of soft clustering method and primarily predicated on concept of segmenting data by utilizing membership examples of cases which are computed for every cluster. However, most of the current fuzzy clustering modules packaged in both open source and commercial products have not enough enabling users to explore fuzzy clusters deeply and visually when it comes to investigation of different relations among clusters. Furthermore, without a decision maker or an expert, it's hard to decide the number of clusters in fuzzy clustering studies. Fuzzy clustering is an effective clustering approach which associates a data point with multiple clusters. Standard fuzzy clustering models like fuzzy c-means derive from minimizing the sum total cluster variation, which will be defined because the sum of the distances between the data points and their corresponding cluster centers weighted by the membership degrees. In this paper, we propose a fuzzy minimax clustering model by minimizing the utmost value of the pair of weighted cluster variations in such a way they

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satisfy a prior distribution. We derive a required condition for the extremum point of the fuzzy minimax clustering model, and then design an iterative algorithm for solving the extremum point.

LITERATURE SURVEY

Xin, Guan et al. [1] presented a novel clustering technique for wireless sensor networks. During the phrase of cluster initialization, the sensed zone is divided into several virtual hexagons which it can avoid the overlapping nodes of circular cluster. Furthermore, they made some sub-circle in the formatted virtual hexagon base on the average distance between the common nodes and the cluster's center. Depending on the special factor's value, each node will form a cluster heads order list. The clustering technique adopts a new method for cluster head election, which can avoid the frequent election of cluster head. Simulation results demonstrate that their proposed algorithm is effective in prolonging the lifetime of networks. Yuan, Jinhui, and Hong Chen [2] proposed an optimized clustering technique based on spatial-correlation in wirelesssensor networks (WSN). It combines the advantages of clustering technique with spatial-correlation. It can avoid the impact of unexpected data on the results and get approximate results in a tolerant error by using similarity degree to construct clusters. Moreover, for only cluster-heads transmit data to sink node, it can reduce the messages sent in WSN a lot. It includes four parts: clusters construction, cluster-head election, clustering routing and clusters maintenance. Simulation results show that the approach is energy efficient and has lower average relative error than other approaches. Goli, Sepideh et al. [3] addressed clustering as an efficient way for routing. However, the available clustering algorithms do not efficiently consider the geographical information of nodes in cluster-head election. This leads to uneven distribution of cluster-heads and unbalanced cluster sizes that brings about uneven energy dissipation in clusters. In this paper, an Efficient Distributed Cluster-head Election technique for Load balancing (EDCEL) is proposed. The main criterion of the algorithm, dispersal of cluster-heads, is achieved by increasing the Euclidian distance between cluster-heads. Simulation results show the effectiveness of this approach in terms of balancing intra-cluster energy dissipation and lifetime longevity. Veena, K. N., and BP Vijaya Kumar [4] proposed a method for clustering and their analysis to study the cluster formation, their behaviour with respect to the system parameters and applications requirement. The technique involves the adoption of computational intelligence to form clustering. They had used Nero-Fuzzy technique to obtain Dynamic clustering. The simulations are carried out to evaluate the performance of the proposed method with respect to different parameters of sensor node and applications requirement. Bhattacharjee, S., and Subhansu Bandyapadhyay [5] proposed a dynamic multi hop routing technique using residual energy based clustering algorithm to prolong node as well as network lifetime. Here, clusters are constructed using certain suitable parameters such as remaining energy of the nodes, its centrality, energy efficiency and cluster heads selection frequency Furthermore, after collecting all data within acluster, the cluster heads gradually enhance their transmission range till finding a high residual energy based adjacent cluster heads to forward the data to the base station. In this way the proposed method generates an energy efficient routing path from each sensor to base station to send the data. Simulation results show that their approach effectively conserves energy for cluster heads as well as cluster members and prolong their life time effectively. This proposed method also reduces number of clusters and thus improve the nodes life time significantly. Suroso, Dwi Joko et al. [6] proposed the new method of radio frequency (RF) fingerprint-based techniquefor indoor localization. The received signal strength indicator (RSSI) is used as database values which correspond to the location of the sensor nodes. Fuzzy C-Means (FCM) clustering algorithm is applied as the experiment data cluster method. FCM algorithm is deployed to cluster the obtained feature vectors into several classes corresponding to the different amount of RSSI values. The results show that FCM can cluster the target node in a group of the fingerprint database. The location of target node is arranged in various forms to validate the accuracy of the clustering technique. Euclidean distance is used as the parameter to compare the similarity between fingerprint database and the target location. The results show that the new method is simple and effective method to reduce the complexity and to support the low power and to reduce the time using in the fingerprint-based localization technique. Zytoune, Ouadoudi et al. [7] presented a new algorithm for cluster forming in wireless sensor networks based on the node residual energy compared to the network one and allowing a better partitioning the network area. The simulation results show that this algorithm allows network stability extension compared to the most

known clustering algorithm. Thomas, Aby K., and R. Devanathan et al. [8] proposed a technique by which energy consumption can be reduced by introducing dynamic multilevel hierarchical clustering and where by enhancing the network lifetime. An energy consumption model is framed to make a better analysis of the system. A state transition pattern for the nodes is also allotted for the introduced nodes to make better use of the inherent energy of each node. Wang, Sheng-Shih et al. [9] proposed a clustering technique, called ELECT, to provide an energy efficient and reliable routing in wireless sensor networks. The ELECT considers node status and link condition, and introduces a clustering metric, called predicted transmission count (PTX), to evaluate the qualification of nodes for cluster heads and gateways. Each cluster head or gateway candidate depends on the PTX to derive a priority. The cluster head or gateway candidate with the highest priority will become the cluster head or gateway. Simulation results show that the proposed ELECT significantly outperforms the clustering technique using a random selection and considering only link quality and remaining energy in packet delivery ratio and energy consumption. Dutta, A. Raju et al. [10] discussed that mobility of sensor node in Wireless Sensor Network (WSN) is one of the key advantages of wireless over fixed communication system. But to track the sensor node in the heterogeneous network is more challenging and difficulties. In heterogeneous system, generally power consumption is more then homogeneous system. Coordination in distributed sensor network the implementation ofclustering is an important technique and clusters of bounded size which is the total number of nodes in a specific cluster, is an important parameter in clustering algorithms which are very much effective in reducing energy consumption by minimizing the neighborhood of a node. Communication cost is also an important parameter for computation in a large area. Clustering techniques is Wireless Sensor Networks (WSNs) compare to random sampling is less costly due to the saving of time in journeys, reduction in number of transmissions and receptions at each node, identification, contacts etc. Which are valuable for increasing the overall network life, scalability of WSNs. Clustering sensor nodes is an effective and efficient technique for achieving all the requirement. In this paper, they studied the comprehensive theoretical aspects of the clustering problem to energy optimization in wireless sensor networks. Bhowmik, Shimul et al. [11] proposed Mean neighbor clustering algorithm that evenly distributes the nodes around the clusters and form well balanced clusters in the system. The proposed Mean neighbor clustering protocol uses the local neighborhood information to form balanced clusters in sensor networks. The proposed method is also compared with various existing clustering protocols in sensor networks. Comparison is done based on parameters like cluster number, average cluster, cluster range, circularity and hop distance. Simulations show that their proposed algorithm performs better than other neighborhood aware clustering techniques. Varalakshmi, P. et al. [12] proposed an efficient fuzzy based Clustering technique to minimize the energy consumption in WSNs. Their key contribution is that the proposed model not only ensures the minimal energy consumption but also guarantees to carry out an efficient aggregation without any data loss. Energy level, neighbor concentration and distance from the base station (BS) are consider for the proposed fuzzy based clustering technique. Adulyasas, Attapol et al. [13] proposed a clustering technique, included CH selection and rotation, using an event-driven data reporting during continuous data monitoring of ambient. SNs in this technique report only necessary data when data changes exceeding a given threshold. Therefore, clusters are created only upon specific places where such necessary data changes are happening. Furthermore, the clusters are operated as long as the ambient situation is changing. Once the situation becomes stable, the clusters will be reset and every sensor node in these clusters switch to sleep mode in order to conserve energy consumed by CHs and members. Results show that the network lifetime and stability is better than some existing protocols. Gupta, Itika, and A. K. Daniel et al. [14] proposed an efficient clustering algorithm with position based multihop approach to partition the network region into levels with increasing number of cluster heads at each level. The cluster head closer to base station have smaller in size because it forwards the data to base station using Round Robin Technique to make the network more efficient. The proposed protocol improves the performance in delay and energy consumption. The proposed approach is more scalable than the existing solution. Kannadhasan, S. et al. [15] proposed a graph theory based secure data aggregation which has a three phases. They assumed the transmitted power and sensing power of the nodes. First phase performs the clustering and cluster head election process.

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Second phase performs the each clusters are calculated the distance, Energy and also dependence. Third phase performs the shortest path calculation was transmitted the data to secured or not. Finally the aggregated data was transmitted from the cluster heads to the base station. Their proposed models are analysis the acknowledgement through the base stations. Barakkath Nisha et al. [16] proposed the relative correlation based clustering (RCC) technique with high data accuracy and low computational overhead. Identifying spatial, temporal correlation and attribute correlation is the first phase of the proposed algorithm. The second phase is optimal cluster formation and outlier classification based on two correlation levels. The inference of the proposed idea shows high outlier detection rate with different outlier corruption level. Moreover, their results when compared with previous approach taking the same data into consideration clearly outperform them, identifying high level of detection rate (99.87%) in the top-line with near to the ground false alarm rate. Tripathy, Asis Kumar, and Suchismita Chinara. Et al. [17] proposed an authenticated data

transmission technique for Clustered wirelesssensor netwo rk (CWSN). The proposed scheme starts by assigning the identity, shared secret key and an encryption key to the sensor nodes by the base station (BS). Driven by the technology advances in micro-electronics, it is possible to run some key management techniques at each sensor level. This step helps in authentication of the sensors and secured communication in the network. Subsequently the sensor nodes are deployed in the hostile environments, due to the self healing nature of the sensors, they will form a network to transmit the data. The secured communicating protocol described in this paper guarantees that, when two sensor nodes are in communication, they must have gone through prior authentication and key pre-distribution process. The proposed scheme is invariant to the environment where the clusters are formed dynamically and periodically. According to the message communication point of view, they were restricting the network from receiving junk message from the adversaries or compromised nodes due to the authentication and confidentiality. Sert, Seyyit Alper et al. [18] introduced a new clustering approach which is not only energy-efficient but also distribution-independent for wireless sensor networks (WSNs). Clustering is used as a means of efficient data gathering technique in terms of energy consumption. In clustered networks, each node transmits acquired data to a cluster-head which the nodes belong to. After a cluster-head collects all the data from all member nodes, it transmits the data to the base station (sink) either in a compressed or uncompressed manner. This data transmission occurs via other cluster-heads in a multi-hop network environment. As a result of this situation, cluster-heads close to the sink tend to die earlier because of the heavy inter-cluster relay. This problem is named as the hotspots problem.

PROPOSED METHODOLOGY

Figure 1 represents the flowchart of the proposed methodology.

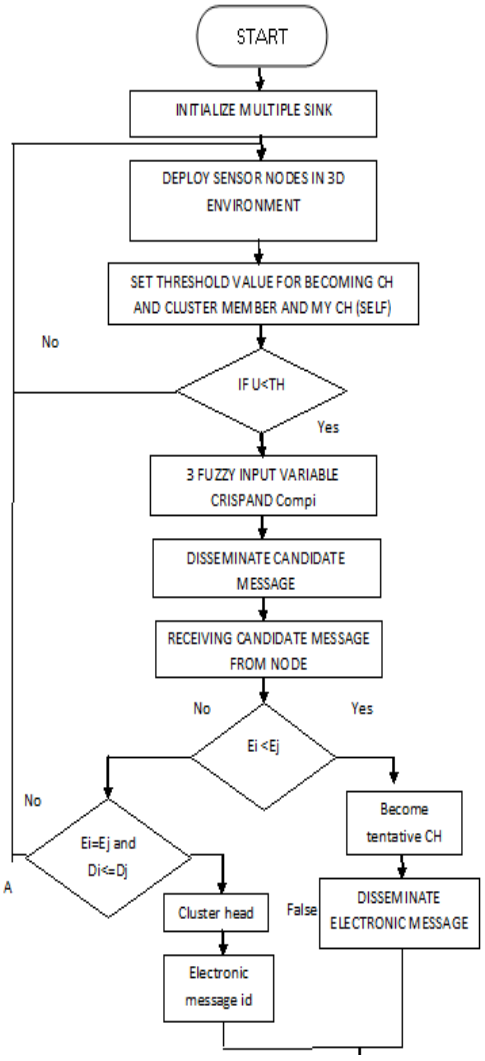

Fig 1: Flowchart of the proposed methodology

RESULTS AND DISCUSSIONS

FIRST NODE DEAD: - Table 1 shows the first node dead evaluation of the existing and the proposed protocols. In the table, it is clearly shown that the proposed performs better as compared to the existing technique.

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TABLE 1: FIRST NODE DEAD EVALUATION

Initial energy	Existing Technique	Proposed Technique
0.03	67	138
0.05	125	241
0.07	206	328
0.09	317	425
0.11	331	520
0.13	338	598

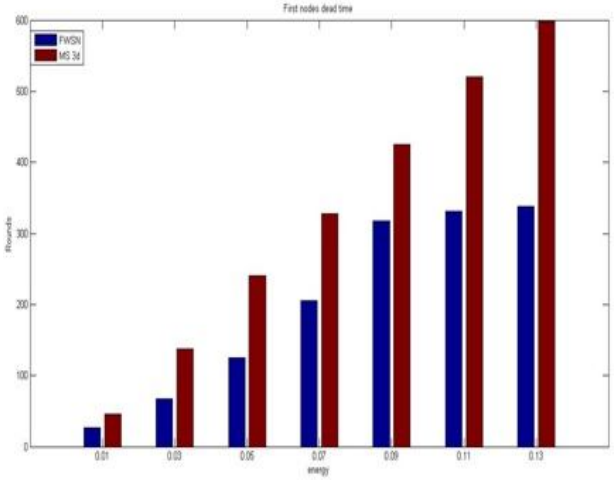

Fig 2 : FIRST NODE DEAD ANALYSIS

Fig. 2 is showing the comparison of existing and the proposed technique with respect to total number of rounds in case of first dead node when the number of nodes are changed. X-axis is representing number of initial energy. Y-axis is representing the number of rounds. It has been clearly shown that proposed outperforms over the existing technique.

TENTH NODE DEAD: - Table 2 shows the tenth node dead evaluation of the existing and the proposed protocols. In the table, it is clearly shown that the proposed performs better as compared to the existing technique.

TABLE 2: HALF NODE DEAD EVALUATION

Initial energy	Existing Technique	Proposed Technique
0.03	130	148
0.05	212	247
0.07	300	347
0.09	405	443
0.11	491	545
0.13	561	643

Fig. 3 is showing the comparison of existing and the proposed technique with respect to total number of rounds in case of tenth dead node when the number of nodes are changed. X-axis is representing number of initial energy. Y-axis is representing the number of rounds. It has been clearly shown that proposed outperforms over the existing technique.

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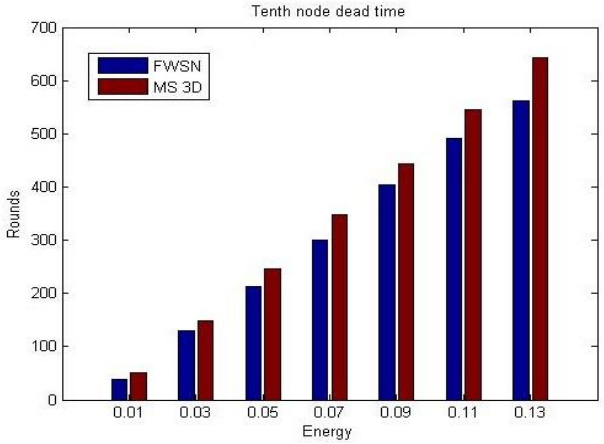

Fig 3: TENTH SSNODE DEAD ANALYSIS

ALL NODES DEAD: - Table 3 shows the all node dead evaluation of the existing and the proposed protocols. In the table, it is clearly shown that the proposed performs better as compared to the existing technique.

TABLE 3: ALL NODE DEAD EVALUATION

Initial energy	Existing Technique	Proposed Technique
0.01	82	88
0.03	257	261
0.05	399	430
0.07	577	608
0.09	744	774
0.11	897	1003
0.13	1029	1127

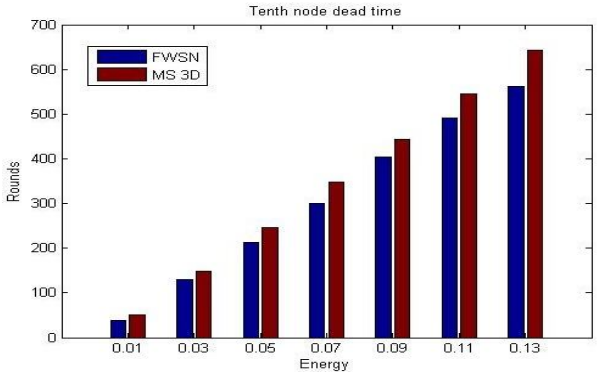

Fig 4: ALL NODE DEAD ANALYSIS

Fig. 4 is showing the comparison of existing and the proposed technique with respect to total number of rounds in case of all dead node when the number of nodes are changed. X-axis is representing number of initial energy. Y-axis is representing the number of rounds. It has been clearly shown that proposed outperforms over the existing technique.

6. CONCLUSION AND FUTURE SCOPE

This paper has proposed a new multi-objective fuzzy clustering algorithm has the ability to address both hotspot and energy hole problem in station and evolving networks which has no fix structure. Although fuzzy clustering has shown better results than traditional protocol but it has not considered the use of multiple sinks as well as 3D wireless sensor network. As multiple sink and 3D based network has become very popular so that main objective of this paper is to explore the benefits of multi-objective fuzzy clustering algorithm for multiple sink and 3D wireless sensor. The comparative analysis has clearly shown that the proposed technique outperforms over the available techniques. In near future we will use swarm intelligence based data aggregation to enhance the results further.

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