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RESEARCH ARTICLE

An Improved Stable Clustering Mechanism for Heterogeneous WSN Optimization

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Abstract: ***The optimized communication in a sensor network is always a challenging task. A clustered architecture divides the network in sub-segments and performs the cluster head adaptive communication. In this work, an improvement to the clustered architecture is provided by reducing the cluster switching. The stability here is achieved in terms of energy estimation and the time vector for cluster formation. This stable approach has reduced the energy consumption for cluster formation so that the network communication and network life is improved. The work defined here is for energy unbalanced heterogeneous network to optimize the clustering. The work has also provided the multihop communication with in clusters to deliver the packets to cluster heads. As the cluster heads will get the packets, the aggregative communication path will be generated to deliver the packets to base station. The comparative experimentation results show that network is optimized.***

Keywords – Clustered, Stable, LEACH, Communication

1. Introduction

As the sensor network is basically defined for specialized applications and environment the network is also defined along with specification of architectural constraints. One of such common architecture is zone adaptive architecture. In this architectural form, the network is divided in smaller segments called zone. Each node of the zone is controlled by a controller node that accepts the data from the zone nodes and takes the selective decision. After applying some aggregative operation, the collected data is passed to next base station using a multi hop path. There are number of existing protocols that work on this zone adaptive architecture. The main aim of zone adaptive architecture is to provide the optimize network communication under energy vector. The work is here defined as an improved clustered architecture so that the network restrictions will be utilized and the performance of the network in terms of communication and network life will be improved.

A) Clustered Architecture

Network architecture not only defines the placement of nodes in the network but also defines various criteria for network communication. This kind of architecture is effective to provide the communication for large network with small sensing range. The multi path communication can also be reduced by using the aggregative information transmission. This network

form is also adaptive to provide the reliable and accurate information transmission when the available resources are restricted. This network form has reduced the network communication and energy consumption so that the network transmission is improved. The network model for this work is given here under.

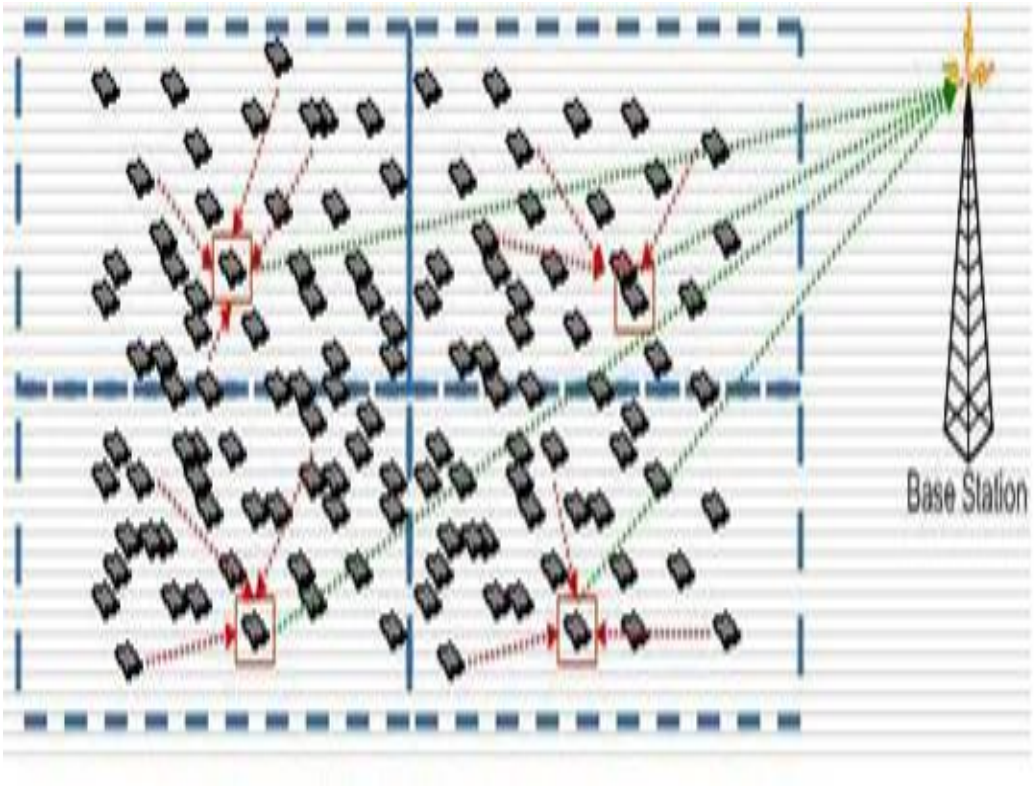

Figure 1: Clustered Architecture

The main application area of sensor network is to work on real time data that is generally obtained by the sensor node by observing the environment or the specific component. To provide the environment effective communication, it is required to configure the network and the nodes respective to the relative constraints. The examples of such kind of information collection include the temperature analysis, humidity analysis etc. Once the data is collected, the next work is to perform data distribution among nodes and to perform the final transmission to the main base station so that the outer world can get and use this information.

In this present work, a node stability analysis approach is defined to improve the clustered architecture. In this section, an exploration to the clustered architecture and its requirement in sensor network is described. In section II, the work defined by earlier researchers is described. In section III, the proposed research methodology is explained. In section IV, the results obtained from the work are explained. In section V, the conclusion obtained from the presented work.

2. EXISTING WORK

Lot of work has been already defined to improve the clustering behavior for sensor network. In this work, an adaptive clustering mechanism is presented based on node stability. The work here is defined to improve the network communication under architectural analysis. In this section some of the work defined by earlier researchers is discussed. Marcelo P. Sousa[1] defined a work on cooperative communication for image sensor network. The author defined the integration of two main protocols called LEACH and SCA and improved the performance of existing system by using the route request identification. Marcelo Portela Sousa[2] defined a work based on the fuzzy adaptive heuristic analysis so that the cooperative improvement to the network would be formed. Author defined the cross layer analysis under fuzzy modeling so that the clustering and the routing over the network would be improved. Author defined the threshold adaptive approach to improve the network communication. Neetesh Purohit[3] defined an improvement to the existing LEACH protocol so that the network strength is analyzed and cluster formation based communication would be performed. Author

defined the cooperative communication based on the operational analysis and transmission control analysis so that the clustering mechanism would be improved.
Mohamed Elhawary[4] defined a work on energy optimization based on the cooperative nature of the network. Author improved the cluster formation under recruit neighboring model based on the network assistance. Author defined the improvement to the clustering mechanism so that the network communication is be improved and end-to-end delay would be reduced. Author defined the model under energy adaption and error rate so that the improved network communication would be achieved. Zhu Yong[5] defined an energy adaptive clustering so that the algorithmic improvement to the network would be defined. Author defined the energy adaptive cluster formation. The process modeling here is defined based on cluster head election and process modeling and data transmission. Hanady M. Abdulsalam[6] has defined a work on LEACH protocol to improve the connectivity under weight analysis and formation so that the network handling to the network would be improved.
Feda' Al-Maaqbeh[7] presented a fuzzy adaptive clustering with rule specification so that the network density based clusters will be formed. Author provided the uniform distribution of network nodes so that the communication stability would be achieved. Xiaohua(Edward) Li[8] presented a work on node level synchronization so that the adaptive cooperative communication would be formed. Author defined the improvement to the energy optimization so that the critical vector analysis based communication would be performed. Geoffrey Werner Challen[9] defined a work distributed architecture based on energy adaptation. Author applied the decision making under node sensing. Author also achieved the component level evaluation to improve the network life. D A Vidhate[10] presented a work on adaptive network clustering with hierarchical protocol generation and formation. Author defined the random selection of nodes so that the cluster switching is be optimized. Hania Aoudia[11] defined an energy adaptive LEACH so that the network formation under memory adaption would be achieved. Author achieved the clustering under energy and distance optimization.

3. PROPOSED WORK

The presented work is here defined as an improvement to the existing work to improve the network stability so that the clustered architecture will be improved. In the traditional architecture, the clustering is based on the probability vector. In this kind of probability based clustering, the cluster formation is modified with each communicating round. In this work, an adaptive clustering mechanism is proposed. According to this presented work model, the analysis on the network nodes will be done to perform the cluster formation or cluster selection. The work will reduce the cluster switch and track the existing clusters. Till the cluster node strength is high it will not recall the clustering process. This presented approach will improve the clustering mechanism by enhancing the cluster strength. As the clustering time and energy is saved overall network life will improved. As the network life is improved, the alive nodes can perform the communication for larger time interval so that the network communication will be improved itself. The algorithmic approach for cluster formation is given in this section in figure 2.

As shown in the figure, a region effective and node sensitivity adaptive clustering model is presented in this work. According to this presented model, the clustering is performed on multiple sub segments in parallel instead of applying the clustering independently for all the segments. The clustering model defined here includes the node sensitivity analysis. The sensitivity is here identified as the area density analysis and the node criticality analysis. Based on these vectors, the adaptive thresholds are defined separately for the sensitive regions and normal regions. Once the limits are decided, multiple parameters are applied to perform the clustering. These parameters are energy, probability vector and distance analysis. The experimentation is performed on random energy network with specific constraints. After performing the cluster selection and the cluster members, the next work is to perform the communication.

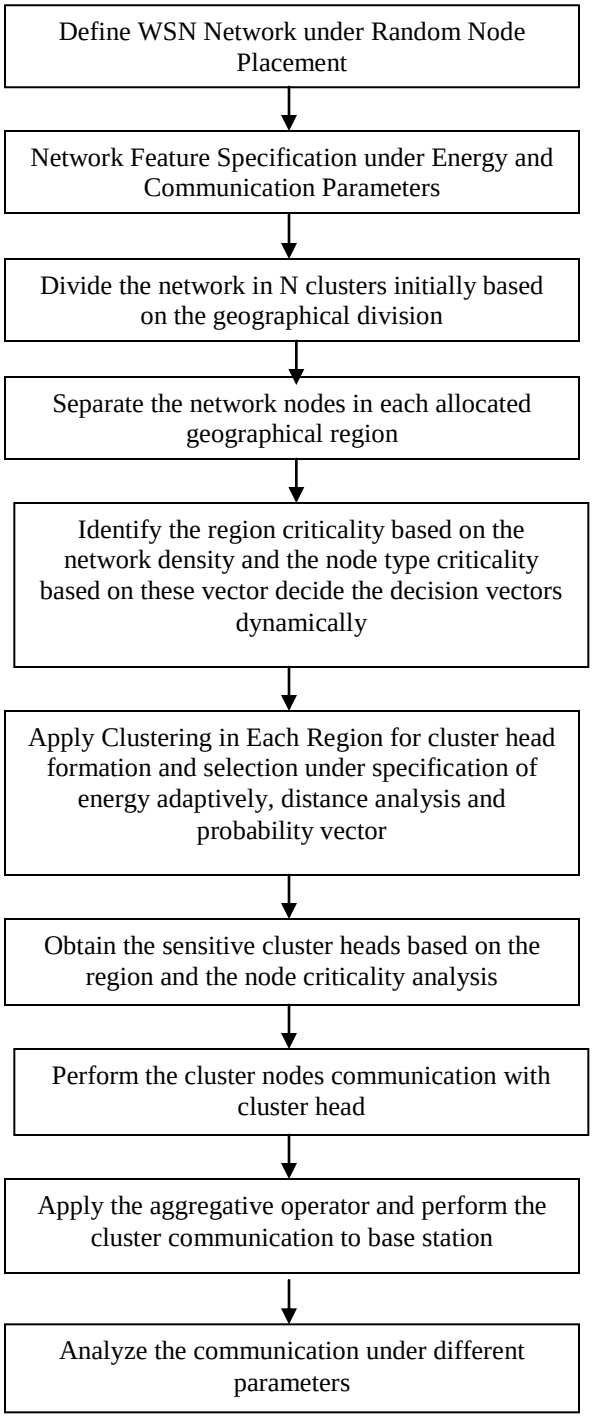

Figure 2 : Clustering Model

In this network form, all the cluster members deliver the data to the adaptive cluster head. To perform this intra cluster communication, the inner sensing range is defined. The nodes present in the range can perform the direct communication with cluster head whereas the nodes outside the inner range will perform the multihop communication. The selection of the

path to the cluster head is done under distance and energy parameters. Based on these parameters the packets will be delivered to the base station.

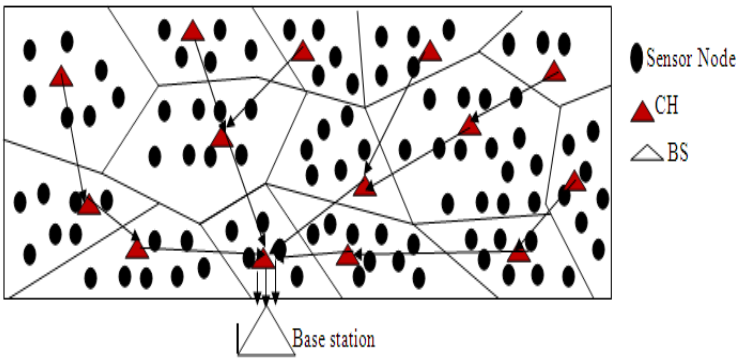

Figure 3 : Multihop Aggregative Communication

As the cluster head accepted the packets from all the cluster members it combine these packets under some aggregative operation and deliver it to the base station. The base station is also defined with specific sensing range. The cluster heads that are in range of base station can perform direct communication with base station but the nodes that are not in range will have to generate a multihop path to communicate with base station. Each participating node will give some amount of energy loss based on its role such as the aggregator, communicator or the forwarder. The aggregator gives the maximum energy loss whereas the forwarder gives the minimum energy loss. The multihop communication architecture is shown in figure 3. The constraint specific experimentation results are described in next section.

4. RESULTS

The work experimentation is here applied on clustered network architecture to achieve the energy adaptive optimization. The simulation parameters considered in this work are given here in table 1

Table 2 : Network Parameters

Parameter	Value
Area	100x100
Number of Nodes	100
Probability Vector	0.1
Initial Energy	Random
Transmission Energy Loss	50 nJ
Receiving Energy Loss	50 nJ
Forwarding Energy Loss	10 nJ
Topology	Random
Base Station Position	50x50
Number of Rounds	1000

The work is here implied to perform the effective network communication under the limitations of sensor network. The analysis of the work is here done in terms of dead node analysis, alive node analysis, energy consumption and packet communication. These results are described in this section

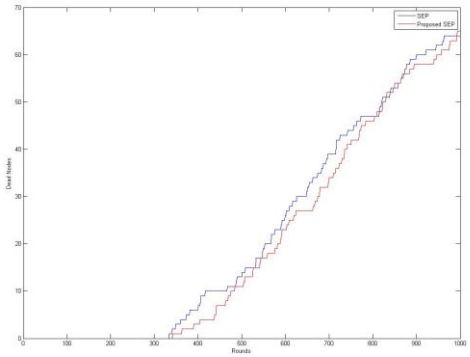

Figure 1 : Dead Node Analysis

Here figure 1 is showing the network life analysis in terms of dead node identification respective to communication rounds. The figure shows that the presented work has improved the network life.

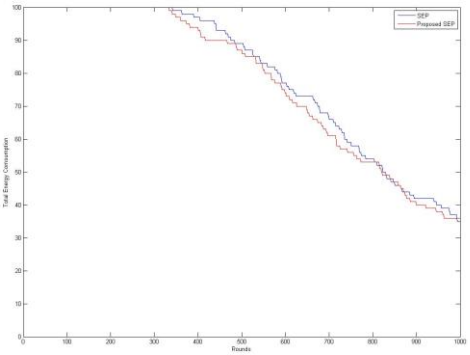

Figure 2 : Network Energy Analysis

Here figure 2 is showing the analysis on the network in terms of energy vector. Here x axis represents the communication rounds and y axis represents the network energy. The figure shows that the proposed work has reduced the energy consumption over the network.

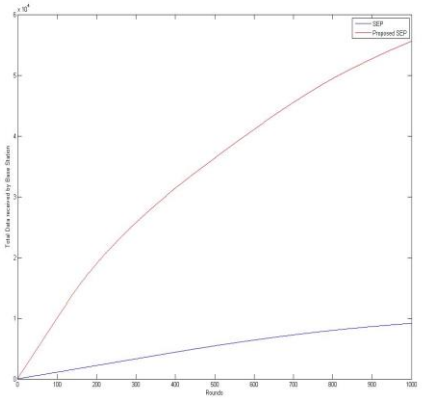

Figure 3 : Packet Communication Analysis

Here figure 3 is showing the packet communication analysis in case of proposed work. Here x axis represents the communication rounds and y axis represents the packet communication. The results show that the presented work has improved the packet communication in the network.
behaviour is improved in this work,

5. CONCLUSION

In this present work, an improved network architecture is defined not stability analysis. The stability is here achieved in terms of network life and network communication scenario. The comparative experimentation shows that the work has improve the network life and network communication.

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