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An Energy Balanced Approach for Cluster Head Selection in Sensor Network

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***Abstract*— A sensor network requires the QoS optimization in terms of energy. To achieve this, an energy balanced multihop communication is defined in a Cluster Head specific network. In this proposed work, complete network is divided in smaller segments and each segment is defined with a specific Cluster Head. This Cluster Head is responsible to handle the communication within the segment. In this present work, the Cluster Head is defined with internal and external communication range specification. According to this, the network communication is defined in a prioritized way. These all communications are optimized here to optimize the overall network communication. The obtained results from system shows the effective generation of Cluster Head specific network as well as reliable communication over the network. The results shows that the work has improved the network communication and improved the network life.**

***Keywords*— Cluster Head Specific, Segmented, QoS, Energy Effective**

I. INTRODUCTION

To optimize the sensor network communication, it is required to optimize the network architecture. One of such architecture is defined under the network limitation in terms of short distance communication. According to this network architecture, complete network is divided in smaller segments and each segment is controlled by a controller node called Cluster Head. The nodes within the segment can perform direct communication with Cluster Head. There are number of existing protocols that work for same kind of network architecture such as LEACH protocol. The work in such kind of network is divided in two main stages. In first stage, the effective election of Cluster Head is required. As the basic approach, the Cluster Head can be decided based on the probabilistic analysis. The other approaches to decide the Cluster Head includes the energy specific estimation. A node having the effective energy can be considered as the Cluster Head for the system. The work is here defined to optimize the communication within the network and to optimize the Cluster Head selection approach. The Cluster Head selection is here defined under the routing protocol consideration with the specification of the Cluster Head and the network specific architecture. According to the localization of the nodes, there are number of such communication specific protocols such as PEGASIS, ESPDA etc. The common network architecture adapted most of networks is shown in figure 1.

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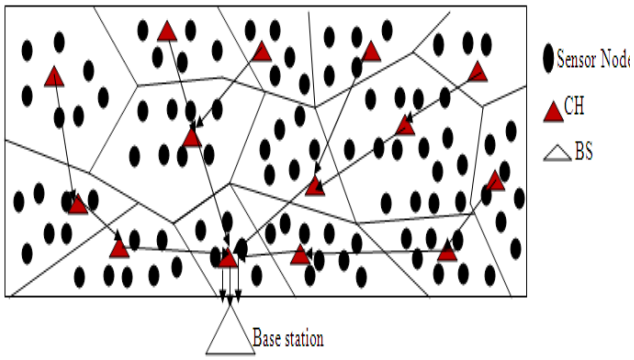

Figure 1 : Segmented Sensor Network

As the Cluster Head receives data from the segment nodes, the final delivery is performed to the base station. This base station specific communication is performed by distance node in aggregative way. The aggregation is the energy adaptive communication approach defined in sensor network. In this communication form, the multihop communication is performed and as the information is transmitted to the next hop. The hop combines its information with the data packet and performs the data aggregation. There are number of aggregative operations such as union, sum, average etc. Finally this agreegative information is transmitted to the base station. The base station receives this aggregative communication and performs the communication with outer world. The aggregation is basically adaptive to reduce the multiple communication over the network.
Different researchers provided the different phenomenon based approaches to perform the communication in such segmented network. These all communication types are controlled by the base station as the whole. The connected dominating set is also generated as the sub graph so that the communication redundancy will get reduced. This kind of network provides the significant communication over the network. Author defined different work to optimize the network communication by performing the effective selection of dominated nodes. To perform this, the connectivity based sub graphs are generated and the nodes are added to the current set to optimize the communication. The communication in such network is controlled under the dominated communication set so that the cover set problems will get optimized.

These kind of dominating sets are also analysed under the aggregative communication analysis. These all Cluster Head must be defined in range of other Cluster Head so that the neighbourhood respective communication should not be dropped. The algorithms are defined to perform the communication to identify such dominating nodes. The work is divided in two main phases. In first phase, the neighbour node analysis is performed while selecting the dominating nodes. Once the dominating set is generated, the next work is to connect these dominating nodes with whole network by performing the specific approach based communication. This kind of communication also improves the network reliability and efficiency. The overall objective of such communication is to improve the communication and network life.

In this paper, a cooperative communication approach is defined in Cluster Head specific network. The network is defined with the specification of smaller segments where each segment is controlled by a controller node. The segment formation and the identification of relative Cluster Head to the segment are defined in this work. In this section, the exploration of this kind of architecture is defined along with aggregative communication over the network. In section II, the work defined by the earlier researchers is discussed in this section. In section III, the proposed research methodology is defined and explored.

In section IV, the results obtained from the work are discussed. In section V, the conclusion obtained from the work is presented.

II. EXISTING WORK

In this section, the work defined by earlier researchers is presented. Christine Jardak[1] defined a work on the improvement of sensor network by considering the sensing data specific scenario generation. This kind of network is defined under different application to analyse the structural formation of network along with the specification of network generation and Cluster Head selection approach. The work is defined to improve the network communication under the traffic volume analysis. The network architecture is defined with the formation of the system along with the specification of the node type. The owrk is presented in the form of framework that can be scaled to different network type respective to the type of data and the deployment. Zilong Jin[2] has defined a network analysis approach to perform adaptive communication over the network. This kind of network is defined under the cluster based ration analysis. This ration analysis is performed to analyse the path los so that the optimal cluster formation will be done. The channel based performance optimization is defined to improve the communication and to reduce the loss over the network. Author performed the performance analysis under the simulation scenarios. Author improved the packet reception rate in sensor network. Dongyul Lee[3] has defined a work based on game theory to generate he effective clusters over the network. Author has presented Nash bargaining approach in sensor network to optimize the communication in cluster adaptive network. Author presented the work as a model to reduce the energy consumption over the network and optimize the transmission over the network. Author defined an energy adaptive cluster formation approach to identify the cluster head effective over the network along with the cluster member identification. Author[4] defined a clustering approach in sensor network. The network is defined with different configuration nodes so that the protocol specific communication will be performed over the network. This kind of network includes the multilevel communication so that the communication get optimized. The work has also provides the improvement to the network architecture and life.

Sabbir Mahmud[5] presented a work on the deployment of sensor network with K base stations. Author propose a unified heuristic for both problems. In the special case of one static base station, Author propose an optimal, polynomial time algorithm. In the special case of one mobile base station, Author present an efficient heuristic. Author have simulated Presented optimal algorithm, Presented heuristics, and the MinDiff-RE heuristic proposed by Azad and Chockalingam. A work on energy effectiveness in sensor network with node localization and routing is defined by Christian Dominguez Median in year 2011. As the size of the network increases, this problem becomes more complex due the amount of sensor nodes in the network. The meta-heuristic Ant Colony Optimization (ACO) has been proposed to solve this issue. ACO based routing algorithms can add a significant contribution to assist in the maximisation of the network lifetime and in the minimisation of the latency in data transmissions, but this is only possible by means of an adaptable and balanced algorithm that takes into account the WSN main restrictions[6]. Hania Aoudia has defined a work on hierarchical routing in sensor network. Author propose a critical improvement of the LEACH (Low-Energy Adaptive Clustering Hierarchy) routing protocol for the optimization of the energy consumption as well as memory occupation of Wireless Sensor Network (WSN)[7].

Anand Pandya[8] has defined an energy effective routing and clustering approach in sensor network. Author have proposed a novel three phase approach for energy efficient routing using multipath routing and clustering technique. In Wireless sensor network (WSN), sensor node has limited battery supply and transmission range, so it can not directly communicate with sink node. Hence, multi-hop and multi-path communication is essential[8]. Pin Nie has presented clustering algoirhtm under the energy awareness[9]. Milind Pande has defined a hybrid architecture for agriculuter sensor network. This paper

proposes the novel architecture of WSN which uses existing Radio Frequency/ Free Space Optical (RF/FSO) link model and hybrid energy source for base station for precision agriculture. -win situation to establish WSN for precision agriculture is the objective of this paper[10].

III. RESEARCH METHODOLOGY

A sensor network requires the energy optimized communication over the network. To achieve this either the effective communication mechanism is required or the adaptive network architecture is required. In present work, the combined approach is defined to improve the network architecture as well network communication. In this work a energy effective cooperative communication is defined in a limited area nework. This limited area network is defined in the form of smaller area segments where each segment is controlled by a controller node. This architecture includes the non uniform distribution of nodes over the network. The work is defined in two main stages. In first stage, the identification of effective Cluster Head is performed and later on the effective and reliable communication is performed over the network.

The presented work has defined an improvement to the cooperative communication with the network by including the intermediate nodes. These intermediate nodes are defined in internal area whereas the outer nodes uses these nodes as relay nodes top perform reliable communication. The work is defined to perform the effective selection of these intermediate nodes based on which the cluster specification is performed over the network. This cluster specific communication is performed respective to the placement of nodes over the network and to identify the effective clustering so that the relay selection based communication will be performed over the network. The communication here performed is adaptive to the network so that the network life is improved as well as the network communication improved. The relay node specific communication algorithm is shown in table 1. This algorithmic approach is performed in defined network architecture. The communication is here performed between the nodes and the cluster head.

Table 1 : Cooperative Clustered Routing

```
Algorithm(Nodes, N)
/* the network is defined with N sensor nodes
with the specification of energy for nodes and
the sensing range*/
{
1.  Specify the transmission rate, and
    communication rate parameters for
    sensor nodes.
2.  For i=1 to N
3.  [Process All Nodes]
    {
4.  If(Node(i).Type=”Normal”)
    {
5.  Ch=GetCH(Node(i))
    [Identify the cluster head under
    sensing range analysis]
6.  Dist=GetDist(Ch,Node(i))
    [Find Distance between the cluster
    head and the sensor node]
7.  If(Dist<Limit)
```

```
        {
8.      Perform direct communication
        between the cluster head and
        node(i)
        }
9.      Else
        {
10.     Rly=GetRelay(Node(i),ch)
        [Identify the relay node between the
        node and the cluster head]
11.     Perform communication between
        node and ch via relay node
        }
        }
12.     Analyze the communication over
        the network.
13.     }
```

Another improvement to the work is defined in terms of flat communicating routing shown here under

Table 2 : Aggregative Routing

```
Algorithm(Nodes, N)
/* the network is defined with N sensor nodes
with the specification of energy for nodes and
the sensing range*/
{
    1.      Specify the transmission rate, and
            communication rate parameters for
            sensor nodes.
    2.      For i=1 to N
    3.      [Process All Nodes]
            {
    4.      If(Node(i).Type=”CH”)
            {
    5.      base=GetBase(Node(i))
            [Identify the base station under
            sensing range analysis]
    6.      Dist=GetDist(Base,Node(i))
            [Find Distance between the base
            station and cluster head]
    7.      If(Dist<Limit)
            {
    8.      Perform direct communication
            between the cluster head and base
            station
            }
    9.      Else
```

```
    {
10. Rly=GetRelay(Node(i),bases)
    [Identify the relay node between the
    base station and the cluster head]
11. Perform communication between
    base station and ch via relay node
    }
    }
12. Analyze the communication over the
    network.
13. }
```

IV. RESULTS

The presented work is implemented in matlab environment. The work is analysed in terms of network life and network communication. The results obtained from the work are shown in the form of graph. These graphs are shown here under.

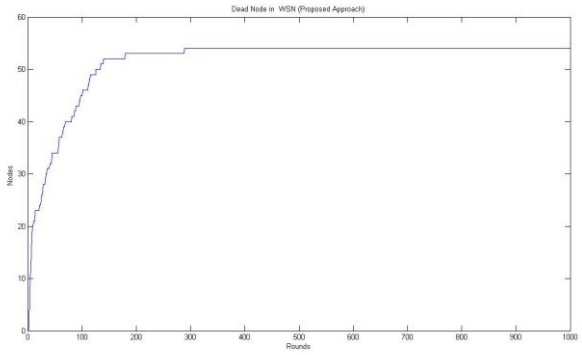

Figure 2 : Dead Node Analysis

Figure 2 showing the dead done analysis in proposed approach. Here x axis represents the rounds and y axis represents the nodes over the network. The curve over the graph is showing the dead node occurrence over the network. Initially No node is dead but as the communication is performed, nodes start losing the energy. As shown in the figure, upto 300 rounds all nodes get dead.

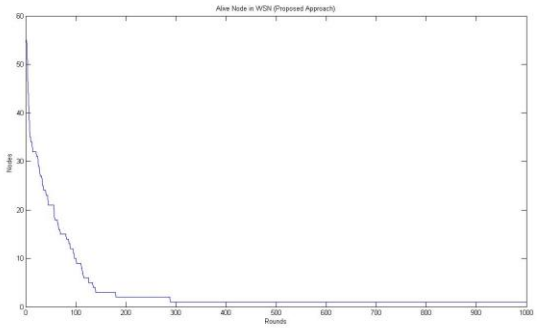

Figure 3 : Alive Node Analysis

Figure 3 showing the alive node analysis in Proposed approach. Here x axis represents the rounds and y axis represents the nodes over the network. The curve over the graph is showing the alive node status over the network. Initially all node are alive but as the communication is performed, nodes start losing the energy. After 300 rounds only two nodes are alive

V. CONCLUSIONS

In this paper, a relay node specific cooperative communication is defined in a clustered network. The communication is here defined within cluster and between the clusters. The results shows the work has improved the network life and communication

REFERENCES

[1] Marcelo P. Sousa," Low-Energy Selective Cooperative Diversity with ARQ for Wireless Image Sensor Networks", 978-1-4244-3574-6/10©2010 IEEE

[2] Marcelo Portela Sousa," Ant Colony Optimization with Fuzzy Heuristic Information Designed for Cooperative Wireless Sensor Networks", MSWiM'11, October 31–November 4, 2011, Miami, Florida, USA. ACM 978-1-4503-0898-4/11/10

[3] Neetesh Purohit," A New Scheme for Cooperative Communication in LEACH based Wireless Sensor Network", 2011 International Conference on Computational Intelligence and Communication Systems 978-0-7695-4587-5/11 © 2011 IEEE

[4] Mohamed Elhawary," Energy-Efficient Protocol for Cooperative Networks", IEEE/ACM TRANSACTIONS ON NETWORKING, VOL. 19, NO. 2, APRIL 2011 1063-6692 © 2011 IEEE

[5] Zhu Yong," A Energy-Efficient Clustering Routing Algorithm Based on Distance and Residual Energy for Wireless Sensor Networks", 2012 International Workshop on Information and Electronics Engineering (IWIEE) 1877-7058 © 2011

[6] Hanady M. Abdulsalam," Data Aggregation for Evolving Wireless Sensor Networks Using W-LEACH", Second Kuwait Conf. on E-Services and E-Systems April 5-7, 2011 ACM 978-1-4503-0793-2

[7] Feda' Al-Maaqbeh," Fuzzy Logic Based Energy Efficient Adaptive Clustering Protocol", ICICS'12, April 3–5, 2012, Irbid, Jordan. ACM 978-14503-1327-8/04/2012

[8] Xiaohua(Edward) Li," Cooperative Transmissions in Wireless Sensor Networks with Imperfect Synchronization".

[9] Geoffrey Werner Challen," IDEA: Integrated Distributed Energy Awareness for Wireless Sensor Networks", MobiSys'10, June 15–18, 2010, San Francisco, California, USA. ACM 978-1-60558-985-5/10/06

[10] D A Vidhate," Performance Evaluation of Low Energy Adaptive Clustering Hierarchy Protocol for Wireless Sensor Networks", International Conference and Workshop on Emerging Trends in Technology (ICWET 2010) – TCET, Mumbai, India ICWET'10, February 26–27, 2010, Mumbai, Maharashtra, India. ACM 978-1-60558-812-4

[11] Hania Aoudia," Hierarchical Routing Approach-Based Energy Optimization in Wireless Sensor Networks", MobiWac'12, October 21–22, 2012, Paphos, Cyprus.
ACM 978-1-4503-1623-1/12/10

[12] Suraj Sharma," A Survey on Secure Hierarchical Routing Protocols in Wireless Sensor Networks", ICCCS'11 February 12-14, 2011, Rourkela, Odisha, India ACM 978-1-4503-0464-1/11/02

[13] U S Sutar," An Energy Efficient Hierarchical Multiple Backup Cluster Head Algorithm for Wireless Sensor Networks", International Conference and Workshop on Emerging Trends in

Technology (ICWET 2010) – TCET, Mumbai, India ICWET'10, February 26–27, 2010, Mumbai, Maharashtra, India. ACM 978-1-60558-812-4

[14] B Sethi," An Energy-Efficient Clustering Scheme to Prolong Sensor Network Lifetime", International Conference and Workshop on Emerging Trends in Technology (ICWET 2010) – TCET, Mumbai, India ICWET'10, February 26–27, 2010, Mumbai, Maharashtra, India. ACM 978-1-60558-812-4

[15] Jose Anand," Analyzing the Performance of Diverse LEACH Algorithms for Wireless Sensor Networks", Int. J. Advanced Networking and Applications (IJANA) 1610 Volume:04 Issue:03 Pages: 1610-1615 (2012) ISSN : 0975-0290