Review of Performance Analysis of Energy Efficient Routing based on Clustering in Wireless Sensor Networks

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***Abstract*—Recent development in electronics and wireless communications has enabled the improvement of low-power and low cost wireless sensors networks. Combination of autonomous devices transmitting locally gathered information to a so-called sink node by using multihop wireless routing are nothing but the Wireless Sensor Networks(WSNs).To design energy efficient routing mechanism to increase the network lifetime due to the limited energy capacity of the network nodes is vital challenge in WSNs. Furthermore, hot spots in a WSNs emerge as locations under heavy traffic load. Nodes in such areas quickly drain energy resources, leading to disconnection in network services. Cluster based routing algorithms in WSNs have recently gained increased interest, and energy efficiency is of particular interest. A cluster head (CH) represents all nodes in the cluster and collects data values from them. To balance the energy consumption and the traffic load in the network, the CH should be rotated among all nodes and the cluster size should be carefully at different parts of the WSNs. In this paper, we proposed an cluster based energy efficient routing algorithm (CBER), CBER elects CH based on nodes near to the optimal cluster head distance and residual energy of the nodes. In WSNs energy is mostly consumed for transmission and reception, it is a non linear function of transmission range.In this paper, the optimal cluster head distance which links to optimal energy consumption is derived. In addition, residual energy is considered in the CH election in order to increase the network lifetime. Furthermore, the energy consumption of being a CH is equally spread among the cluster members. Performance results show CBER scheme reduces the end to end energy consumption and prolong the network lifetime of multi hop network compared to the well-known clustering algorithms LEACH and HEED.**

Keywords - MANETs, Clustering, Energy efficiency, Wireless Sensor Networks, and Routing.
***Index Terms*— Energy-balance, network lifetime, routing protocol, self-organized, wireless sensor network.**

I. INTRODUCTION

Typical sensor nodes are able to carry out sensing, data processing, and communicating components, making it feasible for a wide range of promising applications, such as: environmental monitoring (e.g., humidity ,temperature), disaster and health care areas providing relief, conferencing, file exchange, commercial applications including controlling product quality, military applications and managing inventory. For these purposes, sensors are usually deployed densely and operated autonomously. Furthermore, sensor nodes are normally battery-powered, and left alone makes it quite challenging to recharge or replace node batteries. Hence, one of the important problems in WSNs is how to prolong network lifetime with constrained energy resource. If each and every node starts to transmit and receive data in the network, great data collisions and congestions will be experienced Therefore, the nodes in WSNs will run out of energy very quickly. As a result, the energy of each sensor nodes being a major limitation. At routing layer, the main purpose is to determine ways for energy efficient route and reliable forwarding of data from the source nodes to the sink to save energy consumption. We aims on the network level energy preservation protocols and algorithms in this paper. Clustering is suggested to WSNs due to its advantages of energy saving, network scalability and network topology stability. Furthermore, clustering technique decreases the overheads occurred due to communication, thereby reducing interferences and energy consumptions among network nodes. In addition, clustering improves the efficiency of data relaying by decreasing number of nodes required to forward data in the WSNs, using data aggregation at CHs by intra cluster communication decreases overall packet loses.

II. LITERATURE REVIEW

Aboobeker Sidhik, Ashwani Sharma, Unai Hernandez-Jayo,[1] Cluster based routing algorithms in WSNs have recently gained increased interest, and energy efficiency is of particular interest. A cluster head (CH) represents all nodes in the cluster and collects data values from them. In this paper, cluster based energy efficient routing algorithm (CBER)is proposed, CBER elects CH based on nodes near to the optimal cluster head distance and residual energy of the nodes. In WSNs energy is mostly absorbed for transmission and reception, it is a non linear function of transmission range. In this paper, the optimal cluster head distance which links to optimal energy consumption is derived. In addition ,we consider residual energy in the CH election in order to increase the network lifetime. Furthermore, the energy consumption of being a CH is equally spread among the cluster members. Performance results show CBER scheme reduces the end to end energy consumption and prolong the network lifetime of multi hop network compared to the well-known clustering algorithms LEACH and HEED.

A. K. Daniel and Itika Gupta [2] In this paper, an efficient clustering algorithm is proposed 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. In this paper, we proposed An Energy-Efficient Position Based Clustering Protocol for WSNs using Round Robin Scheduling Technique. It organizes the network by dividing sensor network consisting of N sensor nodes uniformly deployed over a vast field to continuously monitor the environment, into levels.

Wei Feng,Jaafar M.H Elmirghani and Aboobeker [3] . In this paper, we derive the optimal node transmission range, and then we propose the Optimal Range Forward (ORF) algorithm based on the optimal transmission range, which minimizes the total energy consumption of the transmission (summation of energy consumption of all hops). Furthermore, based on ORF, the Optimal Forward with Energy Balance (OFEB) algorithm is proposed, in which the next-hop node is selected according to the remaining energy of each neighbor node and the distance between each neighbor node and the best neighbor location, the latter is determined by the optimal transmission range. In the OFEB algorithm, the total energy consumption of the transmission and the residual energy of each node are both considered to prolong the network lifetime.

Bolian Yin, Hongchi Shi, and Yi Shang [4] In this paper,an energy consumption model for clustered wireless sensor networks is proposed and the optimal transmission range problem is solved since transmission range affects the clustering and in turn affects the energy consumption in the network. Using this model, the total energy consumption can be estimated beforehand based on the traffic pattern, energy model, and network deployment parameters. This model provides an insight into the energy consumption behavior in clustered wireless sensor networks and the relationship among major factors. The optimal transmission range for energy consumption is a function of the traffic load and the node density, but the effect of node density is very limited.

Sangho Yi, Junyoung Heo, Yookun Cho, and Jiman Hong [5] The main goal of this research is concerning clustering protocols to minimize the energy consumption of each node, and maximize the network lifetime of wireless sensor networks. However, most existing clustering protocols consume large amounts of energy, incurred by cluster formation overhead and fixed-level clustering, particularly when sensor nodes are densely deployed in wireless sensor networks. In this paper, we propose PEACH protocol, which is a power-efficient and adaptive clustering hierarchy protocol for wireless sensor networks. By using overhearing characteristics of wireless communication, PEACH forms clusters without additional overhead and supports adaptive multi-level clustering. In addition, PEACH can be used for both location-unaware and location-aware wireless sensor networks. The simulation results demonstrate that PEACH significantly minimizes energy consumption of each node and extends the network lifetime, compared with existing clustering protocols. The performance of PEACH is less affected by the distribution of sensor nodes than other clustering protocols

III. CONCLUSION

In this paper, we proposed the cluster based energy efficient routing algorithm (CBER) to extend the network lifetime, and . simulation results are compared with the previous cluster based routing algorithms LEACH and HEED. The proposed CBER algorithm selects the CH node as the member (within the cluster) .Furthermore, this CH node is the node that has the best residual energy and requires the minimum energy to be reached by the cluster members. In addition, weight parameter α decides relative importance placed on these two parameters. The results from simulations show that the CBER algorithm has best efficiency in terms of both data packets received by sink node and the network lifetime. CBER creates additional overhead of control packets during the end-to-end packet transmission and unbalanced utilization of nodes near sink. Our next step is to improve clustering algorithm to minimize the overhead of control packets and efficient utilization of nodes near sink. Furthermore, to implement in dynamic traffic scenario with adjustable hexagonal structure based on the cluster size.

IV. Acknowledgment

We would like to thanks Aboobeker Sidhik, Ashwani Sharma, Unai Hernandez-Jayo,A. K. Daniel and Itika Gupta,
Wei Feng,Jaafar M.H Elmirghani and Aboobeker, Bolian Yin, Hongchi Shi, and Yi Shang,Sangho Yi, Junyoung Heo, Yookun Cho, and Jiman Hong our anonymous reviewers for their very helpful comments on earlier drafts of this paper.

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