

Cluster Head Selection Based On Hop Count in a Wireless Sensor Networks

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Abstract. In a wireless sensor networks, energy efficiency is essential factor. We propose a cluster head selection method in same hop count for energy efficient routing. This method uses hop-based disjoint head selection for data collection and dissemination. Additionally relaying node is selected by cluster head for connectivity to the sink node.

Keywords: wireless sensor network, routing, energy efficiency.

1 Introduction

Wireless sensor network can be used for many applications such as monitoring for wide area, mobile health care and smart spaces[1-4]. Smart sensor technology and wireless communication technology make these applications stable. In sensor networks, many topics have been researched in several fields such as MAC, topology, query dissemination, data routing and aggregation, and QoS. Many applications of WSN consider energy efficiency because it has a difficulty of recharging battery [5-6].

Sensor node detects some phenomena and delivers data to the sink node. To deliver data to the sink node, sensor node communicates to the sink node directly or by multi-hop. Limited power of sensors makes several routing methods for energy efficiency. Energy efficient routings for wireless sensor network have been researched several papers. LEACH (Low Energy Adaptive Clustering Hierarchy)[7] uses single hop clustering algorithm in which cluster head communicates with the sink directly. However this algorithm is inefficient for cluster head which is located at a distance greater than one hop from the sink. Multi-hop based clustering methods(EEHCA, MCBT, Min-Distance Hop Count Clustering)proposed recently [8-10]. Multi-hop based method would be more efficient than single hop method, but it also increases communication overhead and costs required to obtain routing information [9].Cluster based models also have drawback that cluster head consumes more energy for data gathering and relaying. We also proposed multi-hop based routing with cluster head selection in a same hop count.

The rest of this paper is organized as follows. In section 2, we introduce a cluster head selection method based on radius hop. And we evaluate the proposed method through simulation in section 3, and finally conclude this paper in section 4.

2 Hop-based cluster head selection

In a wireless sensor network, sensor node senses some data and relays data to the sink node. From sensor node to the sink node, direct transmission is difficult for energy efficiency in a wide area. Many other papers propose multi-hop based routing protocols [8-10].

We suggest hop count based disjoint cluster head selection method. With same hop counts, cluster head is selected with disjoint method. One sensor node declares to neighbor sensor nodes its head election and the other neighbor nodes postpone its cluster head broadcasting. Declaring is depends on data which is calculated from remaining energy. Cluster head is role for data aggregation in a cluster and data relaying from downstream cluster heads to the sink node.

The cluster head selection in a same hop count and data relaying to the sink node can be simplified as shown in Figure 1.

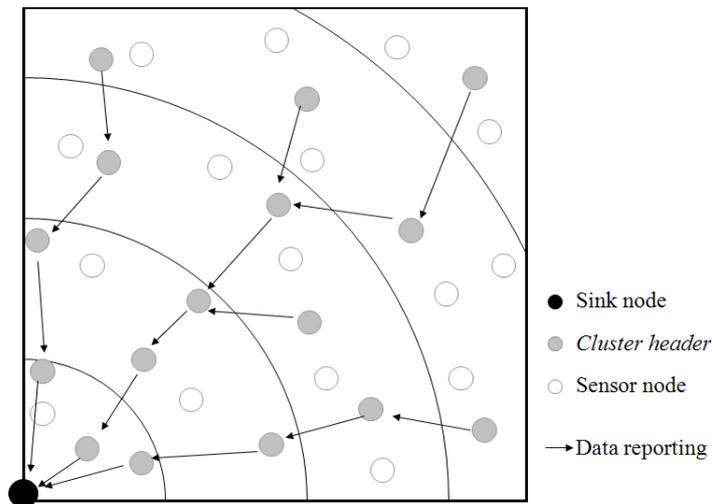


Fig.1. Head selection in a same hop count and data relaying to the sink node

This method provides small number of cluster heads in a same hop count. However some cluster head cannot connect to the sink node by other upstream cluster head. Additionally relaying nodes are selected by downstream cluster head. This additional work is done just one time because relaying node is also included in a cluster upstream hop count.

3 Performance Evaluation

Figure 2 shows selected cluster head in a same hop count and connectivity to the sink node. Selected node marking 'A' is additional node for data relaying to upstream cluster head. A sensor node which detects some sensing data sends to cluster head and this cluster head relays this data to sink node by multi-hop using upstream cluster head.

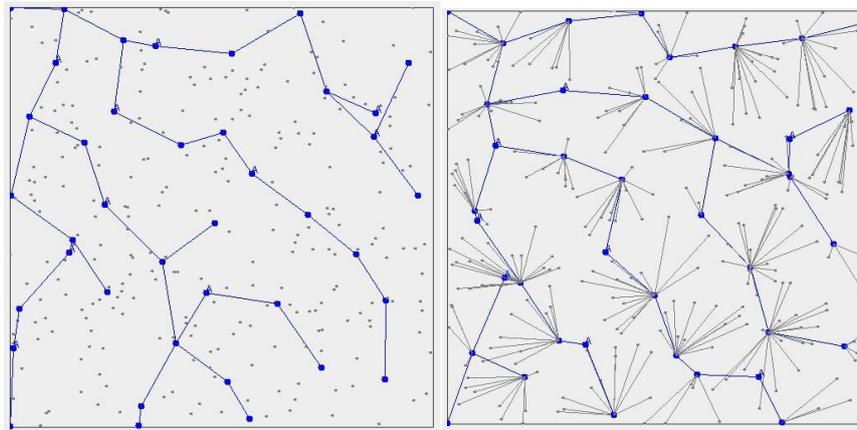


Fig.2.Cluster Head selection in a same hop count and connectivity to the Sink node.
(*Network Area =500*500, Radius=100, Nodes =300*)

4 Conclusion and Future Work

In this paper, we propose a cluster head selection method to preserve the energy by selecting cluster head with same hop count in a wireless sensor network field. Clustering method can provide small set of cluster head in a same hop count but cannot satisfy connectivity to the sink node by multi-hop. With additional selection of relaying nodes, it provides simple way to communication with upstream cluster head.

Our proposed scheme use one-hop count for disjoint cluster head selection. However it can scale up hop count greater than one to applying large-scale network.

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