Research Paper Computer Science

Efficient Approach for Cluster-Based Routing in Wireless Sensor Networks

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ABSTRACT

Recent advances in energy-efficient design and wireless technologies produced many new exciting applications for wireless devices. These applications includes real-time and streaming video and audio delivery, remote monitoring using networked micro sensors, personal medical monitoring, and everyday home networking appliances. Using sensor's node energy enables more network lifetime. For accomplishing this, clustering sensor node technique has been used. This paper focuses on cluster based routing in WSN. In clustering sensor nodes, we consider that a cluster-head consumes more energy than the others when receiving data from cluster members. To avoid more energy consumption we propose, Distributed grouping scheme, where the cluster heads are partitioned into groups and are communicated within their groups in which coarse grained model are required. This reduces energy consumption on WSN and improves lifetime of the network.

Keywords : Wireless sensor networks; Distributed grouping scheme ; Cluster head; energy efficiency

I. INTRODUCTION

A sensor network consists of hundreds or thousands of wireless sensor nodes distributed in a region in uncontrolled and unorganized ways. Clustering techniques can aid in reducing useful energy consumption [1,2]. Clustering is particularly useful for applications that require scalability to hundreds or thousands of sensor nodes. Thus, WSN is divided into several clusters, and in each cluster, one specific sensor node is dedicated to be CH which collects and compresses the data sensed by other nodes within that cluster, and then transmits the aggregated data to Base Station (BS). Sensor data obtained at sensor nodes are sent to a base station through wireless communications. A base station summarizes collected data and presents them to a user or sends them to a remote host. Since sensor nodes derive power from disposable batteries, an energy-efficient data gathering mechanism is indispensable to observe the region as long as possible.

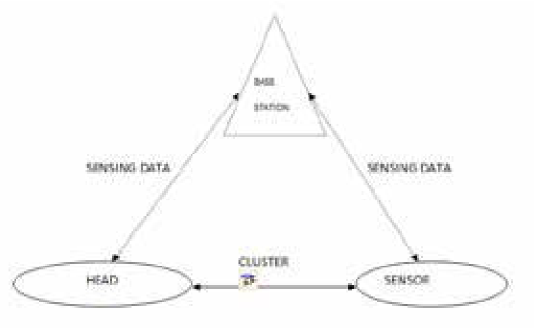


Fig 1:Cluster in sensor networks

Many protocols proposed optimize the methods of cluster heads selection, which are similar to us for energy efficiency, while not focusing on the routing along the path between CHs and BS, especially in continually increscent WSNs [1].

The proposed clustering algorithm [3,4] improves the lifetime of the network by determining optimal cluster size and optimal assignment of nodes to clusterheads. They assume that the number of clusterheads and the location of the clusterheads are known a priori, which is not possible in all scenarios. Moreover the algorithm requires each node to know the complete topology of the network, which is generally not possible in the context of large sensor networks. McDonald et al. have proposed a distributed clustering algorithm for mobile ad hoc networks that ensures that the probability of mutual reachability between any two nodes in a cluster is bounded over time [6,4].Heinzelman et al. have proposed a distributed algorithm for microsensor networks in which the sensors elect themselves as clusterheads with some probability and broadcast their decisions [5,4]. The remaining sensors join the cluster of the clusterhead that requires minimum communication energy. This algorithm allows only 1-hop clusters to be formed, which might lead to a large number of clusters.

In previous research, cluster heads consumes more energy during data delivery. These cluster heads deplete energy quickly, and many researches has been focused on this problem and also to decrease the load of the cluster head. However they fails successful data delivery to base stations with sparse sensor distribution environment. [7]

In section II, the related research is described. In section III, the algorithms are described. In Section IV, we present simulations results. The paper concludes with the summary of results in section V.

II. RELATED WORKS:

Many clustering algorithms in various contexts have been proposed [8-3, 6-9]. These algorithms are mostly heuristic in nature and aim at generating the minimum number of clusters such that any node in any cluster is at most d hops away from the clusterhead. Most of these algorithms have a time complexity of O(n) , where n is the total number of nodes. Many of them also demand time synchronization among the nodes, which makes them suitable only for networks with a small number of sensors.

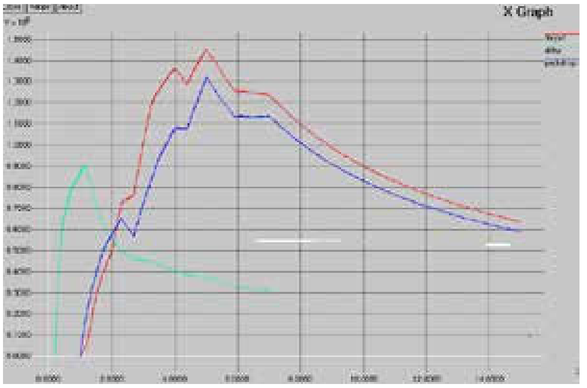
III. ENERGY-EFFICIENT CLUSTERING ALGORITHM:

A. Algorithm

Each sensor in the network becomes a clusterhead (CH) [12,13] with probability p and advertises itself as a clusterhead to the sensors within its radio range. We call these clusterheads the volunteer clusterheads. This advertisement is forwarded to all the sensors that are no more than k hops away from the clusterhead. Any sensor that receives such advertisements and is not itself a clusterhead joins the cluster of the closest clusterhead. Any sensor that is neither a clusterhead nor has joined any cluster itself becomes a clusterhead; we call these clusterheads the forced clusterheads. Because we have limited the advertisement forwarding to k hops, if a sensor does not receive a CH advertisement within time duration t it can infer that it is not within k hops of any volunteer clusterhead and hence become a forced clusterhead. Moreover, since all the sensors within a cluster are at most k hops away from the cluster-head, the clusterhead can transmit the aggregated information to the processing center after every t units of time. This limit on the number of hops thus allows the cluster-heads to schedule their transmissions.Since the objective of our work is to organize the sensors in clusters to minimize this energy consumption, we need to find the values of the parameters p and k of our algorithm that would ensure minimization of energy consumption[10].

IV. SIMULATION RESULTS

Simulation experiment provides the routing protocol in which CHs fall within a given group are relatively close to one another. Hence consumes less energy. Moreover we need more knowledge of all sensor nodes to select its nearest neighbors in which its overhead is highest[11]. Random selection routing needs not know the whole network information and its complexity is distinct less than the shortest path routing as the scalability of WSN is increasing. our strategy is obviously to maintain a scalable, robust and efficient-energy WSN by applying grouping algorithm. grouping-based routing protocol is not to construct an ideal routing protocol, but to extend scalability and reduces CH energy consumption.



a) throughput b) delay c) packetdrop

V. CONCLUSION

We have proposed a grouping scheme for organizing sensors into a hierarchy of clusters with an objective of minimizing the total energy spent in the system to communicate the information gathered by these sensors to the information-processing center. We have found the optimal parameter values for these algorithms that minimize the energy spent in the network. coarse-grained global knowledge of WSNs improves scalability, reduce energy consumption, and enhances the lifetime of network.

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