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Cost Minimization in Shortest Path Communication for Dual Data Uploading in Wireless Sensor Network

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Abstract- *In this paper, a three-layer framework is proposed for mobile data collection in wireless sensor networks, which includes the sensor layer, cluster head layer, and mobile collector (called SenCar) layer. The framework employs distributed load balanced clustering and dual data uploading, which is referred to as LBC-DDU. The objective is to achieve good scalability, long network lifetime and low data collection latency. At the sensor layer, a distributed load balanced clustering (LBC) algorithm is proposed for sensors to self-organize themselves into clusters. In contrast to existing clustering methods, our scheme generates multiple cluster heads in each cluster to balance the work load and facilitate dual data uploading. At the cluster head layer, the inter-cluster transmission range is carefully chosen to guarantee the connectivity among the clusters. Multiple cluster heads within a cluster cooperate with each other to perform energy-saving inter-cluster communications. Through inter-cluster transmissions, cluster head information is forwarded to SenCar for its moving trajectory planning. At the mobile collector layer, SenCar is equipped with two antennas, which enables two cluster heads to simultaneously upload data to SenCar in each time by utilizing multi-user multiple-input and multiple-output (MU-MIMO) technique. The trajectory planning for SenCar is optimized to fully utilize dual data uploading capability by properly selecting polling points in each cluster. By visiting each selected polling point, SenCar can efficiently gather data from cluster heads and transport the data to the static data sink. Extensive simulations are conducted to evaluate the effectiveness of the proposed LBC-DDU scheme. The results show that when each cluster has at most two cluster heads, LBC-DDU achieves over 50 percent energy saving per node and 60 percent energy saving on cluster heads comparing with data collection through multi-hop relay to the static data sink, and 20 percent shorter data collection time compared to traditional mobile data gathering.*

Keywords – *Wireless sensor networks (WSNs), data collection, load balanced clustering, dual data uploading, multi-user multiple-input and multiple-output (MU-MIMO), mobility control, polling point*

I. INTRODUCTION

Wireless Sensor Networks (WSNs) is composed of multifunctional miniature devices with sensing, computation and wireless communication capabilities. Wireless sensor Networks gains the world-wide attention in recent years due to the advances created in wireless communication, data technologies and physical science field. It contains an oversized variety of device nodes with restricted energy. The sensing and transmission of knowledge involves an enormous quantity of energy consumption. In the existing system the Formation of clustering algorithm is used to cluster the nodes in network. Then it organizes sensors into clusters and allows cluster heads to take the responsibility for forwarding data to the data sink. The relay routing, in which data are relayed among sensors. Besides relaying, some other factors, such as load balance, schedule pattern and data redundancy are carried out. Due to this type of progress, there is no uniform energy consumption in the network. This non uniform energy consumption will lead to delay time in the network. So time taken is increased while transmitting the packets. The ratio between total no of packets transmitted from the source and total packets received by the destination node is known as Packet delivery ratio. The packet delivery ratio will be decreased due the delay caused while transmitting the packets from one node to another node. While considering the security concern, the existing system doesn't deserve for that. To overcome the issues occurred, we propose a system called SENCAR which collects the

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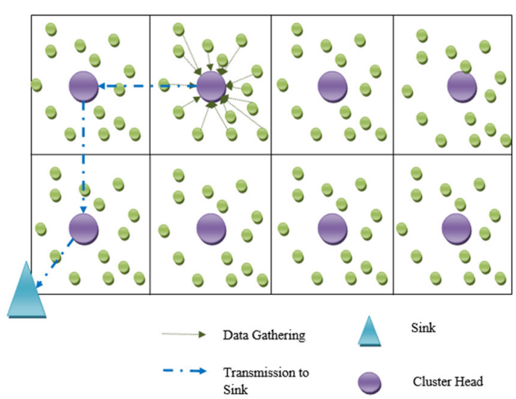
information and upload the data to sink. This can be achieved by using an efficient mechanism for path choosing. Large communication path takes, the more time taken to reach packet in destination. Shortest path distance communication, use Distributed Kruskal's technique is implemented to handle SENCAR collected to sink node in available paths and also calculating the cost for communication. By using this enhanced technique, the time delay caused while transmitting packets can be reduced and the packet delivery ratio can be improved in a predominant way. A uniform energy transmission is achieved while leads to decreased energy consumption. The security issues occurring in the existing system can be rectified by following this enhanced method.

Problem Statement

Although these works provide effective solutions to data collection in WSNs, their inefficiencies have been noticed. Specifically, in relay routing schemes, minimizing energy consumption on the forwarding path does not necessarily prolong network lifetime, since some critical sensors on the path may run out of energy faster than others. In cluster-based schemes, cluster heads will inevitably consume. The authors are with the Department of Electrical and Computer Engineer much more energy than other sensors due to handling intra-cluster aggregation and inter-cluster data forwarding. The packet delivery ratio will be decreased due the delay caused while transmitting the packets from one node to another node. Though using mobile collectors may alleviate non-uniform energy consumption, it may result in unsatisfactory data collection latency. Based on these observations, in this paper, we propose a three-layer mobile data collection framework, named Load Balanced Clustering and Dual Data Uploading (LBC-DDU). The main motivation is to utilize distributed clustering for scalability, to employ mobility for energy saving and uniform energy consumption, and to exploit Multi-User Multiple-Input and Multiple-Output (MU-MIMO) technique for concurrent data uploading to shorten latency. Due to this type of progress, there is no uniform energy consumption in the network. This non uniform energy consumption will lead to delay time in the network. Formation of clustering algorithm is used to cluster nodes in network. Organizes sensors into clusters and allows cluster heads to take the responsibility for forwarding data to the data sink. The enhanced relay routing, in which data are relayed among sensors. Besides relaying, some other factors, such as load balance, schedule pattern and data redundancy.

Implementation

A multi-functional mobile collector, called SenCar, which could be a mobile robot or vehicle equipped with a powerful transceiver to gather data. The SenCar periodically visits some predefined sensor positions called anchor points in the field and stays at each anchor point for a period of time. The neighboring set is determined in a way that nodes can communicate with the sensor node at the anchor point in single hops. Choosing anchor points is a crucial step of the data gathering process since it determines the efficiency of energy transferring and the latency of data gathering. All the sensor nodes, gather data through single-hop transmission and use the SenCar to forward data back to the static sink through long range communications. if multi-hop transmission is used, we can collect data from the larger neighborhood of anchor points thereby improving the fairness of data collection. Information theory, link capacity is "elastic" given its dependence on bandwidth and Signal to Interference plus Noise Ratio (SINR), where SINR further depends on a variety of factors such as sensor's transmission power. There is a subtle relationship between transmission power and link capacity. The joint consideration of these factors with concurrent data uploading. A data gathering tour is completed, the SenCar returns to the sink to upload data and re-computes anchor points for the next round.Shortest path technique is very important in sensor to reduce time and cost of distance. Distributed Kruskal's algorithm is used to find Minimum distance path in network. Monitor the packet transmission and receiving capacity of all nodes in a path to choose only shortest path. Shortest path technique to improves the efficiency.



A. Sencar Identify the Battery Condition of Each Node

A multi-functional mobile collector, called SenCar, which could be a mobile robot or vehicle equipped with a powerful transceiver to gather data.The SenCar periodically visits some predefined sensor positions called anchor points in the field and stays at each anchor

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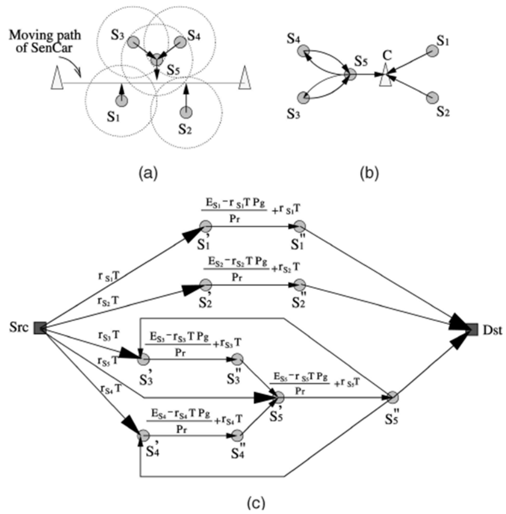
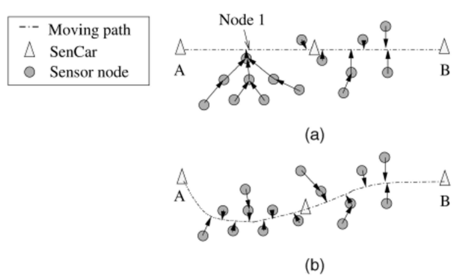
point for a period of time. The neighboring set is determined in a way that nodes can communicate with the sensor node at the anchor point in single hops**.** two-layered heterogeneous sensor networks where two types of nodes are deployed: the basic sensor nodes and the cluster head nodes. The basic sensor nodes are simple and have limited power supplies, whereas the cluster head nodes are much more powerful and have many more power supplies, which organize sensors around them into clusters. Such two-layered heterogeneous sensor networks have better scalability and lower overall cost than homogeneous sensor networks. We propose using polling to collect data from sensors to the cluster head since polling can prolong network life by avoiding collisions and reducing the idle listening time of sensors. We focus on finding energy-efficient and collision- free polling schedules in a multihop cluster. To reduce energy consumption in idle listening, a schedule is optimal if it uses the minimum time. We show that the problem of finding an optimal schedule is NP-hard and then give a fast online algorithm to solve it approximately. We also consider dividing a cluster into sectors and using multiple nonoverlapping frequency channels to further reduce the idle listening time of sensors. We conducted simulations on the NS-2 simulator and the results show that our polling scheme can reduce the active time of sensors by a significant amount while sustaining 100 percent throughput.





B. Collect Data through Anchor Point to Sink

Choosing anchor points is a crucial step of the data gathering process since it determines the efficiency of energy transferring and the latency of data gathering. All the sensor nodes, gather data through single-hop transmission and use the SenCar to forward data back to the static sink through long range communications. if multi-hop transmission is used, we can collect data from the larger neighborhood of anchor points thereby improving the fairness of data collection. The main purpose of energy efficient anchor point selection algorithm is to maximize the network lifetime. These algorithms are not just related to maximize the total energy consumption of the route but also to maximize the life time of each node in the network to increase the network lifetime. The proposed method maximizes the balanced energy consumption in entire sensor nodes due to the mobility of the mobile sink. In addition, the data-loss in the routing path and in the hot-spot area is minimized. To this end, the cluster header nodes send the stored data to the mobile sink by considering the amount of collected data in each cluster header and the mobile patterns of the sink node. To show the superiority of our proposed scheme, we compare it with the existing method based on a mobile sink Relay routing is a simple and effective approach to routing messages to the data sink in a multi-hop fashion. The construction of a maximum-lifetime data gathering tree by designing an algorithm that starts from an arbitrary tree and iteratively reduces the load on bottleneck nodes. Collection tree computes wireless routes adaptive to wireless link status and satisfies reliability, robustness, efficiency and hardware independence requirements. However, when some nodes on the critical paths are subject to energy depletion, data collection performance will be deteriorated. Compared with data collection via a static sink, introducing mobility for data collection enjoys the benefits of balancing energy

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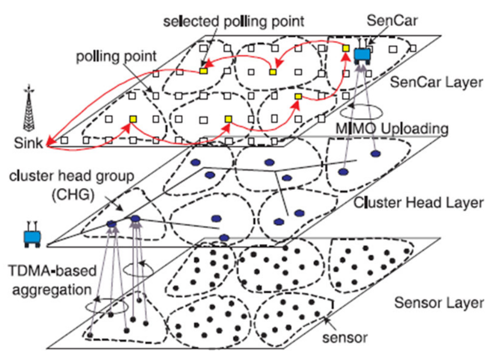
consumptions in the network and connecting disconnected regions. The mobility under random walk where the mobile collector picks update from nearby sensors buffers and finally offloads data to the wired access point. However, random trajectory cannot guarantee latency bounds which are required in many applications. An efficient moving path planning algorithm by determining some turning points on the straight lines, which is adaptive to the sensor distribution and can effectively avoid obstacles on the path. a single-hop data gathering scheme to pursue the perfect uniformity of energy consumption among sensors, where a mobile collector called mobile sink is optimized to stop at some locations to gather data from sensors in the proximity via single-hop transmission. The work was further extended to optimize the data gathering tour by exploring the tradeoff between the shortest moving tour of mobile sink and the full utilization of concurrent data uploading among sensors. Furthermore, the existing an algorithm to study the scheduling of mobile elements such that there is no data loss due to buffer overflow. Although these works consider utilizing mobile collectors, latency may be increased due to data transmission and mobile collector's traveling time.

C. Link between Nodes, Upload Data to Sink

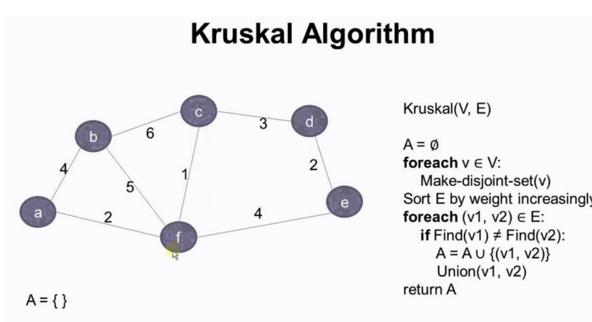
Information theory, link capacity is "elastic" given its dependence on bandwidth and Signal to Interference plus Noise Ratio (SINR), where SINR further depends on a variety of factors such as sensor's transmission power. There is a subtle relationship between transmission power and link capacity. The joint consideration of these factors with concurrent data uploading. A data gathering tour is completed, the SenCar returns to the sink to upload data and re-computes anchor points for the next round.The are used upload data to sink The framework employs distributed load balanced clustering and dual data uploading, which is referred to as LBC-DDU. The objective is to achieve good scalability, long network lifetime and low data collection latency. At the sensor layer, a distributed load balanced clustering (LBC) algorithm is proposed for sensors to self-organize themselves into clusters. In contrast to existing clustering methods, our scheme generates multiple cluster heads in each cluster to balance the work load and facilitate dual data uploading. At the cluster head layer, the inter-cluster transmission range is carefully chosen to guarantee the connectivity among the clusters. Multiple cluster heads within a cluster cooperate with each other to perform energy-saving inter-cluster communications.



the LBC-DDU framework.

D. Shortest Path Planning in WSN

Shortest path technique is very important in sensor to reduce time and cost of distance. Distributed Kruskal's algorithm is used to find Minimum distance path in network. Monitor the packet transmission and receiving capacity of all nodes in a path to choose only shortest path.Shortest path technique to improves the efficiency. Kruskal's algorithm is a minimum-spanning-tree algorithm which finds an edge of the least possible weight that connects any two trees in the forest.[1] It is a greedy algorithm in graph theory as it finds a minimum spanning tree for a connected weighted grap hadding increasing cost arcs at each step This means it finds a subset of the edges that forms a tree that includes every vertex, where the total weight of all the edges in the tree is minimized. If the graph is not connected, then it finds a *minimum spanning forest* (a minimum spanning tree for each connected component)



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IV Conclusion

In this paper we have addressed the problem of Non uniform energy consumption.and Lot of time taken to complete the transmission. We considered the SENCAR collect the information, Upload data to sink using an efficient mechanism for path choosing Shortest path distance communication, use Distributed Kruskal's technique is implemented to handle SENCAR collected to sink node in available paths and also calculating the cost for communication

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