AN EFFICIENT ROUTING STRUCTURE FOR MOBILE USERS DATA COLLECTION IN WSNs

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ABSTRACT

We study the universal data collection for mobile users in wireless sensor networks. People with handheld devices can easily interact with the network and collect data. We propose a novel approach for mobile users to collect the network-wide data. The routing structure of data collection is additively updated with the movement of the mobile user. With this approach, we only perform a limited modification to update the routing structure while the routing performance is bounded and controlled compared to the optimal performance. The proposed protocol is easy to implement. Our analysis shows that the proposed approach is scalable in maintenance overheads, performs efficiently in the routing performance, and provides continuous data delivery during the user movement. We implement the proposed protocol in a prototype system and test its feasibility and applicability by a 49-node testbed. We further conduct extensive simulations to examine the efficiency and scalability of our protocol with varied network settings.

Keywords: Data Collection, Mobile User,Wireless Sensor Networks,

I INTRODUCTION

We investigate the following fundamental question - how fast can information be collected from a wireless sensor network organized as tree? To address this, we explore and evaluate a number of different techniques using realistic simulation models under the many-to-one communication model known as converge cast. We first consider time scheduling on a single frequency channel with the aim of minimizing the number of time slots required (schedule length) to complete a converge cast. Next, we combine scheduling with transmission power control to moderate the effects of interference, and show that while power control helps in reducing the schedule length under a single frequency, scheduling transmissions using multiple frequencies is more efficient.We give lower bounds on the schedule length when interference is completely eliminated, and propose algorithms that achieve these bounds. We also evaluate the performance of various channel assignment methods and find empirically that for moderate size networks of about 100 nodes, the use of multi-frequency scheduling can suffice to eliminate most of the interference.

Then, the data collection rate no longer remains limited by interference but by the topology of the routing tree. To this end, we construct degree-constrained spanning trees and capacitated minimal spanning trees, and show significant improvement in scheduling performance over different deployment densities. Lastly, we evaluate the impact of different interference and channel models on the schedule length.

II. RELATED WORK

As a basic operation, the data collection in WSNs has been extensively studied. A surge of works study the data gathering but with static settings. In addition, according to how does each packet transmitted, the data collection can be further divided into two categories: with collection or without collection. In the former category, in-network collection data results in a reduction in the amount of bits transmitted, and hence, saves energy. Typical examples include [15], [21]. Michael et al. [15] propose the first such protocol. In [21], authors study the construction of a data gathering tree to maximize the network lifetime. In the latter category, Rangwal et al. [14] propose to collect data through a tree structure with fair rate control. [12] proposes to form an information potential-based routing structure. In [11], Challen et al. present IDEA, a sensor network service enabling effective network-wide data collection framework. Even WSNs are capable to support large volume data accessing, while recent works [16], [17], [22] indicate that existing data collection schemes under the static setting incur a poor performance if they are used in the network with mobile users directly. The problem will become even worse if the transmission loss and interference are serious in the network [23]. In the network context with mobile users, most existing works explore how to plan the moving trajectory for the mobile user or sink to achieve an efficient data collection. [18] reactive mobility to improve the target detection performance. Mobile sensors work together with static sensors and move reactively in [18]. Tan et al. [19] further jointly optimizes data routing paths and the datacollection tour. In [24], the authors investigate the approach that makes use of a mobile sink for balancing the traffic load and in turn improving network lifetime. SinkTrail is proposed in [25] as a proactive data reporting protocol, and the SHDGP problem is studied in [26]. Moreover, on the application level, Gao et al. [27] propose to adopt HST tree to distributed manage resources in WSNs and [28] introduces a method to collect event data using mobile sinks. On the other hand, some recent works do not assume the fixed route of mobile users or sinks. In [20], authors propose to use data traffic to probe the future position of the mobile user. The mobile user probing process does not introduce extra communication costs; nevertheless, [20] is not tailored for the optimization of routing tree transitions. In [16], authors propose to use mobility graphs to predict the future data collection position of the mobile user. Lee et al. [17] utilize linear programming to optimize the prediction accuracy. Those works mainly focus on predicting the movement of mobile users to improve routing efficiency. So far as we know, however, no works for directly optimizing the everywhere data collection process of mobile users have been proposed.

III.PROPOSED WORK

Existing work had the objective of minimizing the completion time of converge casts. However, none of the previous work discussed the effect of multi-channel scheduling together with the comparisons of different channel assignment techniques and the impact of routing trees and none considered the problems of aggregated and raw converge cast, which represent two extreme cases of data collection.

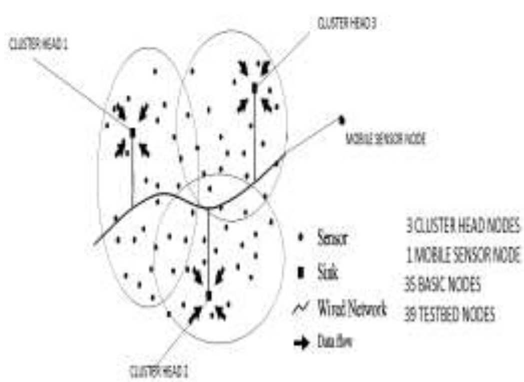


Figure 1: Node Architecture

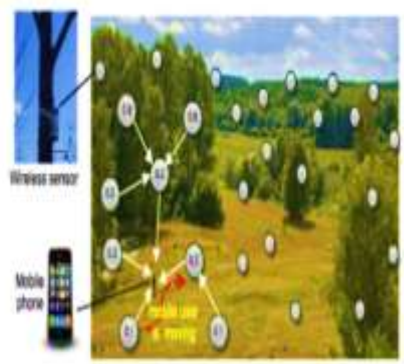


Figure 2: Moving Data Collection

Fast data collection with the goal to minimize the schedule length for collected converge cast has been studied by us in, and also by others in, we experimentally investigated the impact of transmission power control and multiple frequency channels on the schedule length Our present work is different from the above in that we evaluate transmission power control under realistic settings and compute lower bounds on the schedule length for tree networks with algorithms to achieve these bounds. We also compare the efficiency of different channel assignment methods and interference models, and propose schemes for constructing specific routing tree topologies that enhance the data collection rate for both collected and raw-data converge cast.

Figure 3: Flow Diagram of Data Collection

Tree Initialization

Finding number of nodes with in the coverage area.

Tree Updation

Datas are frequently updated inmoving sensor node.

Routing

Used to route packets in the network by finding the shortest path.

Advantage

* Power consumption is low
* Network lifetime is high.
* Reduce the drop.
* Increase throughput

IV.RESULTS AND DISCUSSION

Nodes have been transmitted at a specified interval one after another. Figure 4 shows that the object collect a data techniques transmitted data to the base stations. Figure 5 shows that the Average Energy Consumption of the Network. Figure 7 shows that the Throughput in the given network

Table 1: Simulation Parameters of the Network

S.No	Parameter	Value
1.	Transmitting Power	70mW
2.	Receiving Power	50mW
3.	Idle Power	8.2mW
4.	Inactive Power	15.2mW
5.	Energy per Individual node	50J
6.	Weighting Parameters W_1 and W_2	0.4, 0.8

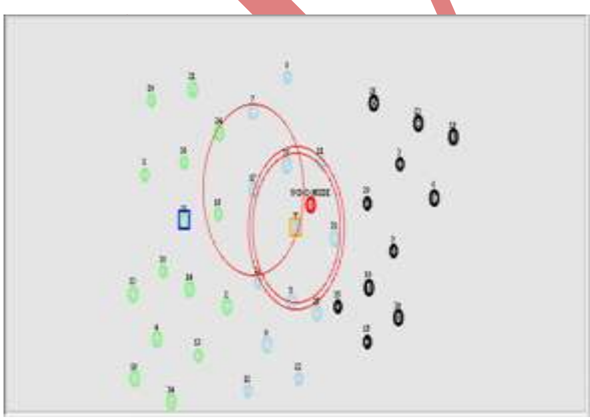
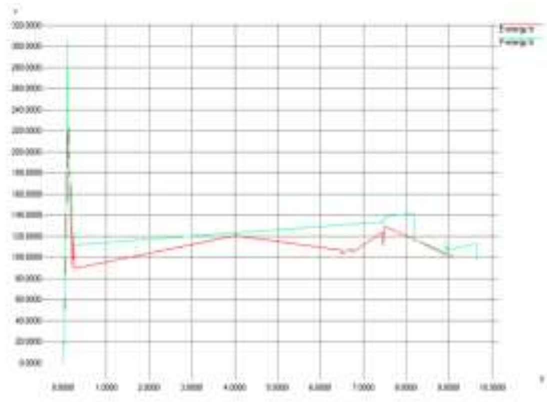


Figure 4: Shows That the Object Collect a Data Techniques **Figure 5: shows that the Average Energy Consumption of the Network.**

In the figure 4 shows the sensed data from the Object tracking techniques in the network. Figure 5 shows the average energy consumed in the data transmission network. It is inferred that the energy consumed decreases as time progresses. The result of energy reduction increases the life time of the network. It gives the energy consumption, when no. of sources is increased.



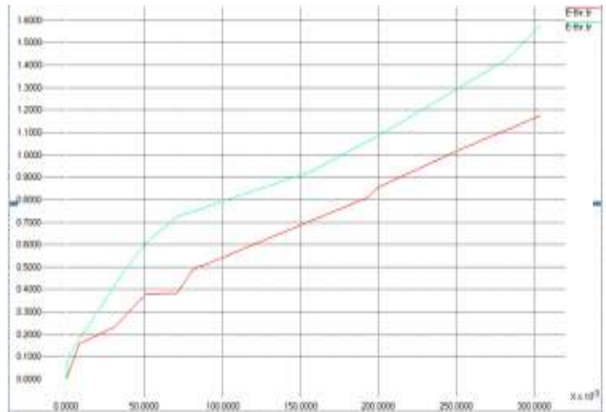


Figure 6: Shows That the Energy Consumption the Given Network Figure 7: Shows That the Throughput the Given Network

Figure 6 shows the average energy consumed in the data transmission network. It is inferred that the energy consumed decreases as time progresses. The result of energy reduction increases the life time of the network. It gives the energy consumption, when no. of sources is increased.

Figure 7 shows the increase in throughput of the proposed technique. The numbers of packets are received when the data is transmitted to the sink successfully. It gives the Packet Received, when no. of sources is increased.

Power Consumption

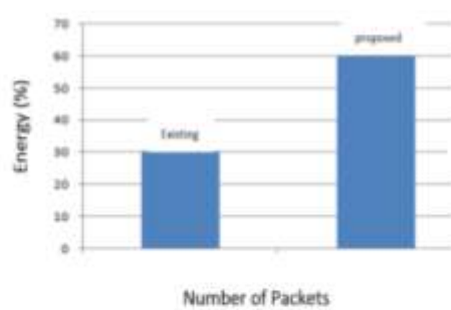


Figure 8: Shows the Power Consumption in the Given Network

V. CONCLUSION

In this work, we study the everywhere data collection for mobile users in wireless sensor networks. Essentially different from existing works, we utilize the three-dimensional correlation to efficiently build and update the data collection tree in the system. Whenever the mobile user moves and changes the virtual sink to access the sensor network, a new data collection tree can be efficiently formed by locally modifying the previously constructed data collection tree. With such an approach, the routing performance is bounded and controlled compared to the optimal performance while the overhead in updating the routing structure is significantly reduced. Such a property ensures low data collection delay, providing real-time data getting hold of for the mobile user. In addition, our proposed protocol is compatible to existing mobility estimate mechanisms and easy to implement. We implement the proposed protocol in a 49- node testbed and test its feasibility and applicability in practice. We further conduct extensive simulations, which prove the efficiency and scalability of our approach.

VI. REFERENCES

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