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Efficiency of Data Collection in Wireless Sensor Network Using Tree Based Network Topology

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Abstract

Fast information can be collected from a wireless sensor network as a tree. We explore and evaluate a number of different techniques using realistic simulation models under the many-to-one communication paradigm known as converge cast. 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. We combine scheduling with transmission power control to mitigate the effects of the interference, and say that while power control helps in reducing the schedule length under a single frequency, scheduling a transmission using multiple numbers of frequencies is more efficient. We give LOWER Bounds limit on the schedule length when interference is completely removed, and propose algorithms that achieve these bounds. We also determine the performance of various channel assignment methods and find empirically that for moderate size networks of about 75-100 nodes, the use of multi-frequency scheduling can suffice to eliminate most of the interference. The data collection rate no longer remains limited by interference but by the topology of the routing tree. Finally, we construct degree-constrained spanning trees and capacitated minimal spanning trees, and show improvement in scheduling performance over different utilization densities, determine the impact of different interference and channel models on the schedule length, is to increase the efficiency of data collection using in wireless sensor network.

1. Introduction

Converge cast, namely the collection of data from a set of sensors toward a common sink over a tree based routing topology, is a fundamental operation in wireless sensor networks (WSN). In many applications, it is crucial to provide a guarantee on the delivery time as well as increase the rate of such data collection. For instances, in safety and mission-critical applications where sensor nodes are deployed to detect oil/gases leak or structural damages, the actuators and controllers need to receive data from all the sensors within a specific deadline, failure of which might lead to unpredictable and catastrophic changes occurs in events. This falls under the category of one-shot data collection. On the other hand, applications such as permafrost monitoring require periodic and fast data delivery over long periods of time, which falls under the category of continuous data collection.We consider these applications and focus on the following parameters/ fundamental questions: "How fast can data are streamlined from a set of sensors to a sink over a tree based topologies?" We study two types of data collections: (i) aggregated converge cast where packets are aggregated at each hop, and (ii) raw-data's converges cast and where packets are individually relayed toward the sinks. Aggregated con-verge cast is applicable when a strong spatial correlation exists in the data, or the goal is to collect summarized information such as the maximum sensors reading. Raw data converges cast, on the other hand, is applicable when every sensor reading is equally important, or the correlation is minimal. We study aggregated converge cast in the context of continuous data collections, and raw material data converge/conversation cast for one-shot data collection. These two types of correspond are two extreme cases of data collection. In an earlier work, the problem of applying different aggregation factors, i.e., data compression factors, was studies was carried out, and the latency of data collections were shown within the performance bounds of the two extreme cases of no data compression (raw-data converge/conversation cast) and full data compressions are (aggregated converge cast). For periodic traffic, it is well known that contention free medium access control (MAC) protocols such as TDMA (Time /data Divisions Multiple Access) are better fit for fast data collection, since they can eliminate collisions and retransmissions and provide guaranteed on the completion time as opposed to contention-based protocols [1]. However, the problem of constructing conflict free (interference-free) TDMA schedules is even under each session.Simple graph-based interface models have been proved to be NP-complete. In this work, we consider a TDMA framework and design polynomial-time heuristics to minimize the schedule length for both types of convergences and cast. We also found lower bounds on the achievable schedules and lengths and to compare the performance of our heuristics with these bounds.

1.1 Impact of Routing Trees:

We investigated the effect of network topologies on the scheduled lengths, and proves that they aggregate converge/convergent cast the performance can be improved by up to 10-15 times on degree constrained trees using multiple frequencies as compared to that on minimum-hop trees using single frequencies. For raw-data converge cast, multi-channel scheduling on capacitated minimal spanning trees can reduce the schedule length by 50%.

1.2 Impact of Channel Models and Interference:

Under the setting of multiple frequencies, one simplifying assumption are often made is that the frequencies are orthogonal to each other. We evaluated these assumptions and showed that the schedules generated may not always eliminate interference, thus causing considerable packet losses. We also evaluated and compared the two most commonly used interference models: (i) the graphs-based on protocol models, and (ii) the SINR (Signals-to-Interference-plus-Noise Reduction Ratios) based on physical models

2. Multiple frequency Channels

To find top k .We use multiple frequencies channels to enable more consistent transmissions and further improvements. Once the multiple frequencies are deployed, the data collection rate are no longer remains limited by the interferences when the multiple senders attempts to send the message to the same receiver at the same time, receiver gets all the data at the same time, but in the present scenario/ days the queues are formed and data is received and sent one after another but not in a single click. To get message at the same time from multiple senders, we add the additional frequency to the original frequency in the receiver side, whenever the receiver moves out our assumed time limit, additionally of extra frequency always vary with place

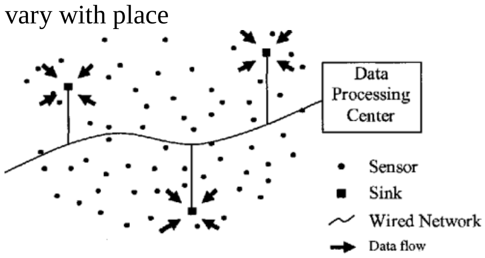


FIG1 : DATA PROCESSING

3 Channels Implementation

3.1 Periodic Aggregated & Evaluated Converge cast

Data aggregations are commonly used technique in WSN that eliminates redundancy and minimize the number of transmissions, thus saving energy and time in improving network lifetime. Aggregations are performed in many ways, by suppressing duplicate messages; using data compressions and packet merging techniques; or taking advantage of the correlation in the sensor readings We consider continuous monitoring and testing the applications gives perfect aggregation values, i.e., each node is capable of aggregating all the packets received from its children as well as that generated by itself into a single packet before transmitting to its parent. The size of aggregated data released and transmitted by each node is constant and does not depend on the size of the raw sensor readings.

3.2 Transmission Power Control:

We can evaluate the impact of transmissions powers and control, in multiple channels, and routing trees with schedules, the performance for both aggregated and raw-data converge cast.. Although the techniques of transmitting power control and multi-channel schedules have been well evaluated & studied for eliminating interference/channels in general wireless networks and their performances for bounding the completion of data collections in WSNs have not been explored in details in the previous cases. The fundamental novelty of our approach lies in the extensive approach of the efficiency of transmission power control and multichannel communication on achieving fast converge cast operations in WSNs.

3.3 Aggregated & collective Data Collection:

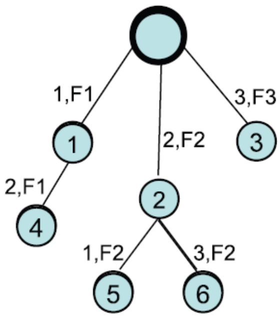
Top K products are listed down in these session/modules. We are using to “find Optimal Incremental Property” algorithms are to identify the

Top K Products. Along with the top K products, had been listed under the suppressed products in the list. Additionally, the number of top products can be dynamically provided by the user .Internal grooving technique is applied to protect the dynamic and changing market. The database is updated periodically with the dynamically and periodically changing attributes and their products.

3.4 Raw Data Collection (aggregated)

The data collection rate often no longer remains limited to the interference but by the topology/measures of the network. Thus, leading to final step, we have evaluated and constructed network topologies with specific properties that help in further enhancing the rate. Our primary conclusion is that, combining these different techniques can provide an order and magnitude to improvement of aggregated converge cast, and a factors of two improvement for raw-data converge cast, compared to single-channel TDMA scheduling on minimum-hop routing trees/techniques.

3.5 Tree (flows) Based Multi-channel Protocols:



TMCP is a greedy, tree-based, multi-channels protocol for collecting data applications. It partitions the network are multiples and sub trees are minimized the intra tree interference by assigning different channels and nodes for residing on different branches starting from the top to the bottom of the tree. Figure shows the same tree given in Fig. (Refer above) which is scheduled according to TMCP for aggregated data collection. Here, the nodes on the leftmost branch is assigned frequency F1, second branch is assigned frequency F2 and the last branch is assigned frequency F3 and after the channel assignments, time slots are assigned to the nodes with the BFST Timeslot Assignment algorithm/Programmed

4. EXPERIMENTAL RESULTS

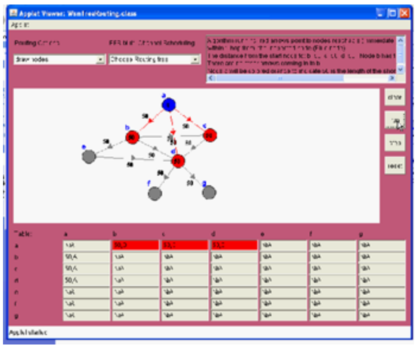


FIG 2 :*FREQUENCY ALLOCATION*

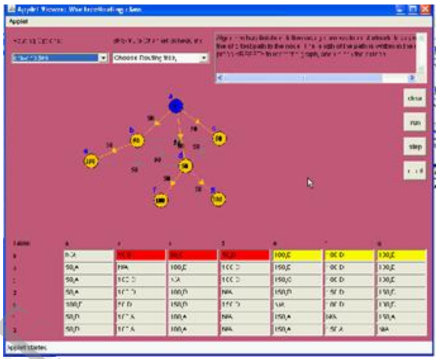


FIG 3: ROUTING PATH

A	B	C	D
100,A	50,B	50,C	100,C
50,A	100,A	100,C	100,D
50,A	100,D	100,D	150,C

FIG4: ROUTING PATH RESULT

5. CONCLUSION

Fast converge cast in WSN where nodes communicate using a TDMA protocol to minimize the schedule length. We addressed the fundamental limitations due to interference and half-duplex transceivers on the nodes and explored techniques to overcome the same. We found that while transmission power control helps in reducing the schedule length, multiple channels are more effective. We also observed that node-based (RBCA) and link-based (JFTSS) channel assignment schemes are more efficient in terms of eliminating interference as compared to assigning different channels on different branches of the tree (TMCP).

6. FUTURE WORK

The other way of doing fast data collection in terms of satellite mechanism to reduce time delay and utilize resources effectively

6.REFERENCES

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