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Effective Mobile Sampling In Broad Cast Network

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ABSTRACT

Mobile objects can be used to gather samples from a sensor field. Civilian vehicles or even human beings equipped with proper wireless communication devices can be used as mobile sinks that retrieve sensor-data from sampling points within a large sensor field. A key challenge is how to gather the sensor data in a manner that is energy efficient with respect to the sensor nodes that serve as sources of the sensor data. In this paper, an algorithmic technique called Band-based Directional Broadcast is introduced to control the direction of broadcasts that originate from sensor nodes. The goal is to direct each broadcast of sensor data toward the mobile sink, thus reducing costly forwarding of sensor data packets. The technique is studied by simulations that consider energy consumption and data deliverability.

Keywords : mobile, broad cast network.

1 INTRODUCTION

The concept of employing mobile objects (sometimes referred to as mobile sinks) to query a sensor network has been proposed [6], [17], [18], [21], [25],[32]. Applications can exploit this mobility to dynamically sample a sensor field. One high-level application scenario is illustrated in Fig. 1.

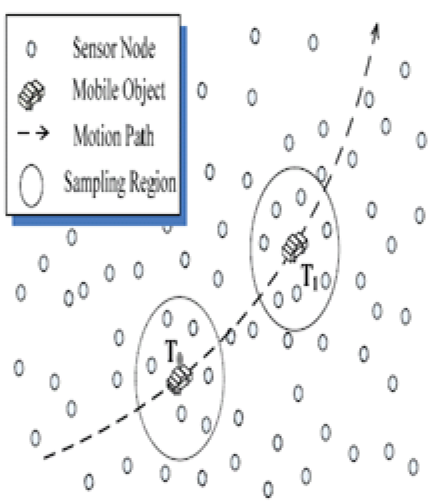


Fig. 1. Sensor field sampling.

A mobile object (car) is traveling along path and at some time and location (for example, T0) it decides to take a sample of the sensor field, i.e., collect sensor data from “near-by” sensor nodes. The larger circle denotes the sampling region. Each sensor in that region will consequently be activated and reply with its locally sensed data. As the mobile object continues its travel, it reaches another location at time T1 from which it initiates another sampling task.

There are three interesting features associated with the task of sensor field data sampling.

First, due to the mobility of the sampling object, there are many options for selecting a sampling region, as opposed to the static sampling region associated with a static sink.

Second, it is possible to employ commonly existing mobile objects, for example, taxis or buses, to help increase the coverage of the sensor field. So, it is possible to deliberately choose a mobile object and finely tailor its sampling regions to optimize a sampling task.

Finally, in comparison to sensor nodes, mobile objects have relatively large (and adjustable) transmission ranges.

Thus, they can trigger sampling-region sensors by the single-hop transmission of a sampling signal. The sampling distance is only constrained by the mobile object’s transmission range, which should be more than sufficient for “local sampling” applications. For more “remote querying” of sensor data, an alternative scheme based on mobile-to-mobile node cooperation can be used. However, there are also challenges that arise from using these mobile sinks to gather sampled sensor data. One challenge is in controlling the process that sensors use to respond to a request for sensor data from a mobile sink. Because sensor nodes have a significantly smaller transmission range than mobile objects, sensor nodes must rely on multi hop transmission of sensor data when they respond to the single-hop reception of the mobile

object’s sampling signal. This asymmetric communication property prevents sensor nodes from using a straightforward routing technique like reverse path forwarding. The fact that the mobile object continues to move after injecting its sampling signal further complicates the use of any explicit destina-

tion oriented routing.
Furthermore, general routing-tree based protocols are not well suited for this situation because route discovery implies high energy cost, and a discovered route might not be easily reused when faced with a series of highly dynamic sampling tasks. Also, because sensor networks are typically very large in scale, they do not naturally allow for a global IP address for each sensor node. This impedes use of traditional IP-based routing methods used in classical communication and wireless ad hoc networks. In addition, power and cost constraints make it impractical to assume GPS capability for very low-cost sensors needed for large-scale sensor network applications, and efficient accurate localization techniques are still in the research stage. Thus, for sampling large-scale sensor networks, it is not desirable to depend on routing protocols that require sensors to be location- aware, such as location-based GAF (Geographic Adaptive Fidelity), and cluster-based LEACH (Low-Energy Adaptive Clustering Hierarchy).

Finally, an implied requirement for sensor field sampling is that there is a time constraint imposed by the mobility of the sink object. To facilitate the collection of sensor data from the sampling region, it is helpful if all sensor data can be routed to the mobile object before the object has deviated significantly from the location at which it initiated the sampling task. This suggests that sensors should respond quickly upon receiving a sampling request, and the sensor data propagation method should be highly efficient.
In this paper, we make no assumptions about the nature of the sensor data, allowing for the possibility that sensors are heterogeneous with regard to data type (e.g., each sensor measures a different environmental property). Thus, deliver ability of sensor data takes priority over performance of data aggregation operations. The approach used in this paper is based on traditional software-based broadcast. Although it is understood that broadcast is to be generally avoided in sensor networks due to the problems associated with message flooding, there are significant advantages to using this basic mechanism, especially for the application at hand, sensor field sampling: broadcast is simple and does not require that sensor nodes be configured with special dedicated hardware; broadcast can be initiated immediately after receiving the sampling task since it requires no routing table or tree setup; and broadcast can naturally handle the mobile sink scenario since a sensor-data packet can reach the mobile object as long as the object is within transmission range of some broadcast, or rebroadcast, of that packet. The primary problem with using broadcast for gathering sensor data is that broadcast does not consider direction, and left unchecked would flood an excessively large geographic region. Note that this flooding could even extend beyond the intended sampling region, which means the omnidirectional broadcast suffers from very low energy efficiency.
Effective broad cast
In this paper, we discuss a new broadcast-based sensor datagathering mechanism. The mechanism is optimized for the purpose of sensor-field data sampling by a mobile object. It is called Band-based Directional Broadcast since it uses the concept of bands created by partitioning the sampling region using multiple concentric circles (see Fig.2 for a quick look).

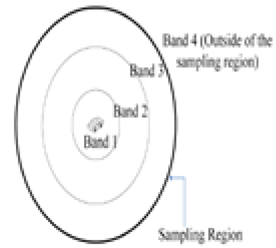


Fig. 2. A 4-band configuration.

These bands are used to help control the direction of data flow of sensor data packets, without the need for sensor nodes having any sophisticated directional antenna. The key idea is that our approach will reduce the propagation of packets that flow away from the sink mobile object—thus reducing broadcast events and sensor node energy consumption. This is accomplished by preventing packets that originate from a sensor in any band from being propagated (rebroadcast) by sensors in a higher numbered band. We know that media access control plays an important role in sensor node routing protocols. This is in part due to the fact that sensor nodes are low-power and have only a single signal-reception channel.

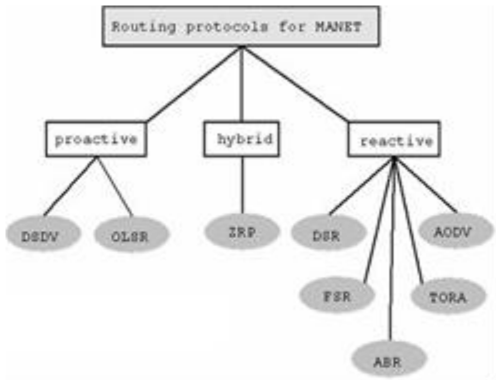
2 Protocols

2.1 Table-Driven (or Proactive)

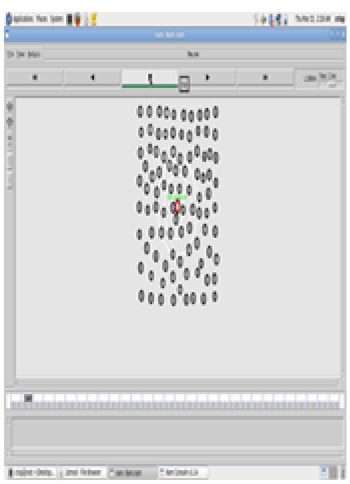
The nodes maintain a table of routes to every destination in the network, for this reason they periodically exchange messages. At all times the routes to all destinations are ready to use and as a consequence initial delays before sending data are small. Keeping routes to all destinations up-to-date, even if they are not used, is a disadvantage with regard to the usage of bandwidth and of network resources. On-Demand (or Reactive) these protocols were designed to overcome the wasted effort in maintaining unused routes. Routing information is acquired only when there is a need for it. The needed routes are calculated on demand. This saves the overhead of maintaining unused routes at each node, but on the other hand the latency for sending data packets will considerably increase.

PROACTIVE:
DSDV (Destination-Sequence Distance Vector)

DSDV has one routing table, each entry in the table contains: destination address, number of hops toward destination, next hop address. Routing table contains all the destinations that one node can communicate. When a source A communicates with a destination B, it looks up routing table for the entry which contains destination address as B. Next hop address C was taken from that entry. A then sends its packets to C and asks C to forward to B. C and other intermediate nodes will work in a similar way until the packets reach B. DSDV marks each entry by sequence number to distinguish between old and new route for preventing loop.



DSDV use two types of packet to transfer routing information: full dump and incremental packet. The first time two DSDV nodes meet, they exchange all of their available routing information in full dump packet. From that time, they only use incremental packets to notice about change in the routing table to reduce the packet size. Every node in DSDV has to send update routing information periodically. When two routes are discovered, route with larger sequence number will be chosen. If two routes have the same sequence number, route with smaller hop count to destination will be chosen.



DSDV has advantages of simple routing table format, simple routing operation and guarantee loop-freedom. The disadvantages are (i) a large overhead caused by periodical update (ii) waste resource for finding all possible routes between each pair, but only one route is used.

3 Conclusion

We proposed a simple, energy-efficient protocol to aid sensor-field sampling by a mobile object. The protocol exploits the concept of bands to limit the propagation of sensor-data broadcasting, providing a form of directional broadcast based on software control. Methods for defining and using bands were presented. Extensive simulation sunder the communication models were conducted to evaluate the performance and trade-offs of our band-based scheme. The communication model assumed no collisions and abinary sensor-to-sensor communication model. The simulations indicated that the band-based scheme is quite efficient in directional broadcast, and moreover, performs much better than default omni directional broadcast .

References

[1] R. Ananthakrishna, S. Chaudhuri, and V. Ganti,"Eliminating Fuzzy Duplicates in Data Warehouses," Proc. 28th Int'l Conf. VeryLarge Data Bases, pp. 586-597, 2002.

[2] R. Baeza-Yates and B. Ribeiro-Neto, Modern Information Retrieval. ACM Press, 1999.

[3] R. Baxter, P. Christen, and T. Churches, "A Comparison of Fast Blocking Methods for Record Linkage," Proc. KDD Workshop Data Cleaning, Record Linkage, and Object Consolidation, pp. 25-27, 2003.

[4] O. Bennjelloun, H. Garcia-Molina, D. Menestrina,. Su,S.E.Whang, and J. Widom, "Swoosh: A Generic Approach to Entity Resolution," The VLDB J., vol. 18, no. 1, pp. 255-276, 2009

[5] S. Chaudhuri, K. Ganjam, V. Ganti, and R. Motwani, "Robust and Efficient Fuzzy Match for Online Data Cleaning," Proc. ACM SIGMOD, pp. 313-324, 2003

[6] M. Bilenko and R.J. Mooney, "Adaptive Duplicate Detection Using Learnable String Similarity Measures," Proc. ACM SIGKDD, pp. 39-48, 2003.

[7] S. Chaudhuri, V. Ganti, and R. Motwani, "Robust Identification of Fuzzy Duplicates," Proc. 21st IEEE Int'l Conf.Data Eng., pp. 865- 876, 2005.

[8] P. Christen, "Automatic Record Linkage Using Seeded Nearest Neighbour and Support Vector Machine Classification," Proc. ACM SIGKDD, pp. 151-159, 2008.

[9] P. Christen, T. Churches, and M. Hegland, "Febrl—A Parallel Open Source Data Linkage System," Advances in Knowledge Discovery and Data Mining, pp. 638-647, Springer, 2004.

[10]] P. Christen and K. Goiser, "Quality and Complexity Measures for Data Linkage and Deduplication," Quality Measures in Data Mining, F. Guillet and H. Hamilton, eds., vol. 43, pp. 127-151, Springer, 2007.

[11] W.W. Cohen, H. Kautz, and D. McAllester, "Hardening Soft Information Sources," Proc. ACM SIGKDD, pp. 255-259, 2000.

[12] W.W. Cohen and J. Richman, "Learning to Match and Cluster Large High-Dimensional Datasets for Data Integration," Proc. ACM SIGKDD, pp. 475-480, 2002.

[13] A. Culotta and A. McCallum, "A Conditional Model of Deduplication for Multi-Type Relational Data," Technical Report IR-443, Dept. of Computer Science, Univ. of Massachusetts Amherst, 2005.

[14] F. DeComite, F. Denis, and R. Gilleron, "Positive and Unlabeled Examples Help Learning," Proc. 11th Int'l Conf. Algorithmic Learning Theory, pp. 219-230, 1999.

[15]] F. Denis, "PAC Learning from Positive Statistical Queries," Proc. 10th Int'l Conf. Algorithmic Learning Theory, pp. 112-126, 1998.

[16] X. Dong, A. Halevy, and J. Madhavan,"Reference Reconciliation in Complex Information Spaces," Proc. ACM SIGMOD, pp. 85-96, 2005.

[17] A.K. Elmagarmid, P.G. Ipeirotis, and V.S. Verykios, "Duplicate Record Detection: A Survey," IEEE Trans. Knowledge and Data Eng., vol. 19, no. 1, pp. 1-16, Jan. 2007.

[18] L. Gravano, P.G. Ipeirotis, H.V. Jagadish, N. Koudas, S. Muthukrishnan, and D. Srivastava, "Approximate String Joins in a Database (Almost) for Free," Proc. 27th Int'l Conf. Very Large DataBases, pp. 491-500, 2001.
[19] B. He and K.C.-C. Chang, "Automatic Complex Schema Matching Across Web Query Interfaces: A Correlation Mining Approach,"ACM Trans. Database Systems, vol. 31, no. 1, pp. 346-396, 2006.
[20] M.A. Hernandez and S.J. Stolfo, "The Merge/Purge Problem for Large Databases," ACM SIGMOD Record, vol. 24, no. 2, pp. 127-138, 1995.
[21] M.A. Jaro, "Advances in Record-Linkage Methodology as Applied to Matching the 1985 Census of Tampa, Florida," J. Am. Statistical Assoc., vol. 89, no. 406, pp. 414-420, 1989.