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Mobile Data Gathering with LBC in Multiple Clusters in Wireless Sensor Networks

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Abstract

Wireless Sensor Network is an emerging technology. WSNs usually consist of a large number of small sensor nodes with limited on board energy supply and deployed densely in a given area for information harvesting purposes. Since the sensor devices have limited memory and power capacity, the power consumption in WSN data gathering becomes as a major issue now a days. So that, in the proposed framework, a scheme to reduce the power consumption in WSN data gathering is introduced. The data gathering framework distributed load balanced clustering and dual data uploading, which is referred to as LBC-DDU. The objective is to achieve good scalability, and low data collection latency. At the sensor layer, a distributed load balanced clustering algorithm is proposed for sensors to self-organize themselves into clusters. In contrast to existing clustering methods, the scheme generates multiple cluster heads in each cluster to balance the work load and facilitate dual data uploading. The mobile collector layer, SenCar is equipped with two antennas, which enables two cluster heads to simultaneously upload. By visiting each selected polling point, SenCar can efficiently gather data from cluster heads and transport the data to the static data sink. In addition the project finding the compatible pairs of polling points becomes a matching problem to achieve optimal overall spatial diversity. The second problem is how to schedule uploading from multiple clusters using enhances poling point detection model. This scheme takes advantages over the previous dual-prediction scheme to minimize communication and computation cost there reducing the energy consumption

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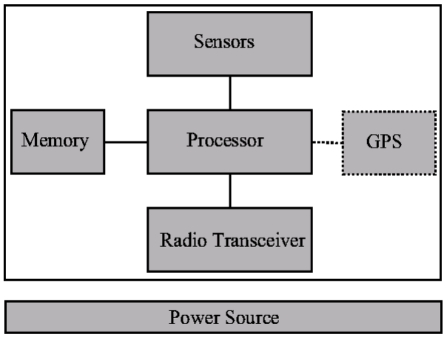
1. Introduction

A Wireless sensor network (WSN) are spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, also enabling control of sensor activity. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on.



WSN Provide a bridge between the real physical and virtual worlds. Allow the ability to observe the previously unobservable at a fine resolution over large spatial-temporal scales. Have a wide range of potential applications to industry, science, transportation, civil infrastructure, and security. The below mentioned diagram shows the Basic Components of a WSN Node

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2. Mobile Data Gathering

The main objective of the mobile Data Gathering technique is to reduce the overall travel time of the mobile node and also reduce the packet delay. Mobile Collectors are called as SenCars. To achieve the uniform energy consumption combines the SDMA technique along with SenCar. This technique adopts a joint approach of Space Division Multiple Access and mobility. The SDMA technique contains multiple antennas that help for concurrent data uploading to a SenCar. There are two cases namely single SenCar and multiple SenCar. For a single SenCar, the main objective is to reduce the total data gathering time. It includes the travelling time of the SenCar and the uploading time of sensors to the SenCar. This problem is referred as mobile data gathering with SDMA (MDG-SDMA).

3. Related Work

Wu Y., Mao Z., Fahmy.S, and Shroff N. Energy efficiency is critical for wireless sensor networks. The data gathering process must be carefully designed to conserve energy and extend network lifetime. For applications where each sensor continuously monitors the environment and periodically reports to a base station, a tree-based topology is often used to collect data from sensor nodes. In this work, we first study the construction of a data gathering tree when there is a single base station in the network. The objective is to maximize the network lifetime, which is defined as the time until the first node depletes its energy. The problem is shown to be NP-complete. We then extend our work to the case when there are multiple base stations, and study the construction of a maximum lifetime data gathering forest. We show that both the tree and forest construction algorithms terminate in polynomial time and are provably near optimal. We then verify of our algorithms via numerical comparisons. The fundamental operation in such applications is data gathering, i.e., collecting sensing data from the sensor nodes and conveying it to a base station for processing. In this process, data aggregation can be used to fuse data from different sensors to eliminate redundant transmissions. Each base station knows the node with maximum inverse lifetime in its local tree and broadcasts its identity and this inverse lifetime to its neighbouring trees. These beacons between neighbouring trees are sent through their adjacent nodes.

Each base station waits for a period of time to that there are no more beacons, and then it calculates the maximum inverse lifetime of the forest and learns the categories of the nodes in its local tree. Thus, base stations locally remove nodes in V1 and V2 and generated components. Then each base station checks connecting edges between the components of its local tree or its neighbouring trees. If a base station needs to perform an “improvement” or “unblock” operation, it broadcasts a beacon with its identity and indicates that it has such operations to perform. We adopt a policy that the base station with the smallest identity value “wins.” After a period of time, all base stations know which base station should perform the operations if there are edges between components in this iteration. After that, each base station waits for a period of time to ensure that the operation has been completed, and then updates its local tree.

Zhao M., Ma M., and Yang Y. To maximize network coverage and to provide a reliable, energy-efficient monitoring depends on selecting minimum number of sensors in active mode to cover all the targets. This power saving technique can be regarded as Set Covering Problem (SCP). Designing for a minimum set of nodes where node selection procedure is based on the energy of each node in a set, provide energy-efficient sensor network. The performance analysis through simulation results show that the algorithm proposed in this paper selects less working nodes than the other algorithms and maximize the network lifetime as well. The problem of gathering data from a sensor network using mobile elements. Mobile elements travel the network in predefined paths, node to be collected and deliver it to be sinking. Each node must be visited by a mobile element that must then reach the sink within the given time constraint. The implement of the project is to plan the paths for the mobile elements that minimize the total length travelled. Several variations of this problem have been considered in existing literature. The nodes should be incremented in the wireless sensor network. Advantages of the wireless distributive system are that of the limitation to be bigger.ant the major application is emergency response and health monitoring. Starting at the root since there is no broadcasting as in RBS, TPSN is expensive Accuracy is in the range of few microseconds. In FTSP, there are radio-layer timestamps, with linear regression, and periodic flooding to make the protocol robust to failures and topology changes in the power allocation. Both transmission and reception of messages are time stamped in the radio layer and differences are used to compute and adjust clock offsets.

4. Data Collection Techniques

The data collection technique is used to collect the aggregate data from the sensor node to the sink node. The main objective of the data collection process is to reduce the delay and improves the network’s lifetime. There are various techniques used to collect the data from source node to sink node.

First, all the sensors are static and then the network is considered as static network. The static sensor node forwards the data to the sink by one or more hops. So, the sensor located nearer to the sink gets depleted soon. Second, the hierarchy form of data collection. The nodes can be categorized into lower layer and higher layer. The nodes in the lower level layers are homogenous sensor nodes. The nodes in the higher layer are more powerful than the no des in the lower layer. The higher layer nodes are called as cluster heads. The hierarchy topology is also called as clusters. Third, Mobile Collector is used to collect the data periodically. A mobile data observer is used to collect the data dynamically. The nodes that can be located closer to the data observer can upload the data directly. The nodes that can be located far away from the observer can forward the data by relaying.

Single Hop Data Gathering problem (SHDGP) and mobile Data Gathering are the two approaches that can be used to increase the lifetime of the network. Single Hop Data Gathering Problem (SHDGP) is used to achieve the uniform energy consumption. The mobile Data Gathering algorithm is used to find the minimal set of points in the sensor network. It serves as data gathering points for mobile node.

A Mobile data Collector can be represented as M-Collector. M-Collector is a device equipped with powerful transceiver and high battery power. It collects the data directly from the sensor node while it roams in the sensing field. By reducing the tour length of the M-collector, the lifetime of the sensor network can be prolonged. The M-collector visits the data in the transmission range of each sensor, in order to find the shortest moving tour.

The sensor nodes represent the polling points or the nodes in one hop range of M-collector. By assuming that the M-collector moves at fixed speed, then the time consumption of the M-collector can be roughly estimated by using the tour length. If the M-collector travels in the shortest path, it results the data collection in shortest time. Thus, the users can collect the up to date data. This problem is referred as the single hop data gathering problem, or SHDGP. The location of every sensor node can visited one by one by using the M-collector. The problem is reduced to Travelling Salesman Problem (TSP). The main objective of the TSP is to find the shortest distance (cost) tour that visits every node in the network at least once. The sensors with fixed transmission power are deployed in large area that can be used in applications such as battlefield surveillance and environment monitoring. M-collector needs to identify the polling points as well as its locations before starts its data gathering tour. The neighbour set of a point defined as the set of sensors. It can upload the data directly to the M-collector. Each sensor in the neighbour set must have at least one polling point to upload the data in single hop. All the sensor nodes should be covered while combining the neighbour sets of all the polling points in the network.

5. Load Balanced Clustering Algorithm

The clustering method, it is apparent that each cluster in LBC typically has a total of M cluster heads. However, some clusters may have fewer than M cluster heads. The reason can be explained as follows. To circumvent the situation that the CHGs of different clusters may share common cluster heads, sensors with tentative status always update their candidate peers once receiving status packets. For sensor si, once its neighbors reach their final status, if si is update its candidate peers to see if they are the current peers. If yes, they will be expurgated from si : A. We define a set X ¼ fvjv 2 si :N; v =2 si: A; v:status ¼ tentative, which represents the possible new candidate peers of si. si would choose the sensors in X with the highest initial priorities to fill the vacancy among its M _ 1 candidate peers. However, in the rare cases that X ¼ F, si would have no replenishment for the vacancy. Therefore, the candidate peers of si could only become fewer and fewer as the update goes on. Later, if si happens to be a cluster head by the self-driven status transition, the size of the CHG, which is formed by si and its update-to-date candidate peers, would be no more than M.

6. Conclusion

Through this project, mobile data gathering framework for mobile data collection is proposed in a WSN. It consists of sensor layer, cluster head layer and SenCar layer. It employs distributed load balanced clustering for sensor self-organization, adopts collaborative inter-cluster communication for energy-efficient transmissions among CHGs, and uses dual data uploading for fast data collection.

The performance study demonstrates the effectiveness of the proposed framework. The results can greatly reduce energy consumptions by alleviating routing burdens on nodes and balancing workload among cluster heads. It is also justified the energy overhead and explored the results with different numbers of cluster heads in the framework. A trial run of the system has been made and is giving good results the procedures for processing is simple and regular order. The process of preparing plans been missed out which might be considered for further modification of the application

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