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MOBILE DATA GATHERING WITH LOAD BALANCED CLUSTERING SCHEDULED UPLOADING IN MULTIPLE CLUSTERS IN WSN

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ABSTRACT:

This paper proposed 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, 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, the 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 scheme. The results show that when each cluster has atmost two cluster heads, the scheme achieves over more energy saving per node and more energy saving on cluster heads comparing with data collection through multi-hop relay to the static data sink.

Keywords: WSN**,** Load balancing, ESenCar, Polling Point, Cluster Polling Point, Data sink

INTRODUCTION:

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.

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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.

- To make the framework employs distributed load balanced clustering and dual data uploading.
- To propose a distributed load balanced clustering (LBC) algorithm for sensors to self-organize themselves into clusters in the sensor layer.
- To make the scheme generates multiple cluster heads in each cluster to balance the work load and facilitate dual data uploading.
- At the cluster head layer, to carefully choose the inter-cluster transmission range to guarantee the connectivity among the cluster

RELATED WORKS:

Kenan Xu et al [1] describe the lifetime of a wireless sensor network (WSN) by designing energy efficient networking protocols, the impact of random device deployment on system lifetime is not stressed enough. Some research efforts have tried to optimize device deployment with respect to lifetime by assuming devices can be placed deliberately. However, the methodologies and solutions therein are not applicable to a randomly deployed large scale WSN. In this research, we propose three random deployment strategies for relay nodes in a heterogeneous WSN, namely, connectivity-oriented, lifetime-oriented and hybrid deployment. We investigate how a strategy can affect both connectivity and network lifetime of a multi-hop heterogeneous WSN, in which relay nodes transmit data to the base station via multi-hop relay. The performance of the three strategies is evaluated through simulations. The results of this research provide a viable solution to the problem of optimizing provisioning of a large scale heterogeneous WSN.

Jin Wang et al [2] describe many applications of wireless sensor networks (WSNs) where sensors are deployed in areas accessed by laid roads sinks can be assembled on mobile devices like bus or handcart. Compare to WSNs with static sink(s), Wireless Sensor Networks with Mobile Sink(s) (MSSNs) are more dominant at energy economization, delay decrease and network lifetime prolongation. In this paper, we propose a Global Best Path (GBP) data gathering algorithm based on wireless Sensor Networks with single Mobile Sink

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(GBP-MSSN). It aims at determining the best position for the single mobile sink and further using global sensors' information to generate the best scheme to gather data from specified node. Generating of best scheme is conducted by GBP algorithm which can balance energy consumption among whole sensor networks and further prolong the network lifetime. Simulation results show that our GBP-MSSN algorithm outperforms conventional algorithms like LEACH, GAF, etc.

Yan Wu et al [3] describes 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 design an algorithm which starts from an arbitrary tree and iteratively reduces the load on bottleneck nodes (nodes likely to soon deplete their energy due to high degree or low remaining energy). 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 the efficacy of our algorithms via numerical comparisons.

Arati Manjeshwar et al [4] describe the wireless sensor networks are expected to find wide applicability and increasing deployment in the near future. In this paper, propose a formal classification of sensor networks, based on their mode of functioning, as proactive and reactive networks. Reactive networks, as opposed to passive data collecting proactive networks, respond immediately to changes in the relevant parameters of interest. We also introduce a new energy efficient protocol, TEEN (Threshold sensitive Energy Efficient sensor Network protocol) for reactive networks. We evaluate the performance of our protocol for a simple temperature sensing application. In terms of energy efficiency, our protocol has been observed to outperform existing conventional sensor network protocols.

In the current body of research done in the area of wireless sensor networks, we see that particular attention has not been given to the time criticality of the target applications. Most current protocols assume a sensor network collecting data periodically from its environment or responding to a particular query. We feel that there exists a need for networks geared towards responding immediately to changes in the sensed attributes. We also believe that sensor networks should provide the end user with the ability to control the trade-off between energy efficiency, accuracy and response times dynamically. So, in our research, we have focused on developing a communication protocol which can fulfill these requirements.

Sudharman K. Jayaweera et al [5] describe the energy-efficient virtual multiple-input multiple output (MIMO)-based communications architecture is proposed for energy-limited, distributed and cooperative wireless sensor networks. Assuming a space-time block coding (STBC) based MIMO system, the energy and delay efficiencies of the proposed MIMO-based communications scheme are derived using analytic techniques. The efficiency of the proposed MIMO-based communication system is related to the system and channel propagation parameters. These investigations show that MIMO techniques can be made to provide significant energy savings and delay efficiencies at the same time with judicious choice of system parameters at the design level. Further, the dependence of energy efficiency of proposed MIMO-based wireless sensor network on fading coherence time and the required amount of training is analyzed. These results justify the application of proposed cooperative MIMO-based scheme in wireless sensor networks even after allowing for additional training overheads.

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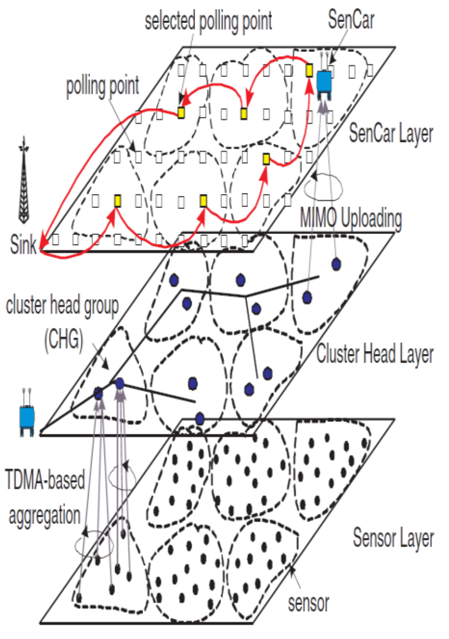
EXISTING TECHNOLOGY:

The existing system presents the distributed load balanced clustering algorithm at the sensor layer. The essential operation of clustering is the selection of cluster heads. To prolong network lifetime, we naturally expect the selected cluster heads are the ones with higher residual energy. Hence, we use the percentage of residual energy of each sensor as the initial clustering priority. Assume that a set of sensors, denoted by S = {s1, s2, …, sn}, are homogeneous and each of them independently makes the decision on its status based on local information. After running the LBC algorithm, each cluster will have at most M (>=1) cluster heads, which means that the size of CHG of each cluster is no more than M. Each sensor is covered by at least one cluster head inside a cluster. The LBC algorithm is comprised of four phases: (1) Initialization; (2) Status claim; (3) Cluster forming and (4) Cluster head synchronization. The existing system has following disadvantages.

- How to find polling points and compatible pairs for each cluster is not studied.
- Partition the continuous space to locate the optimal polling point for each cluster is not carried out.
- To achieve optimal overall spatial diversity is not carried out.
- Schedule uploading from multiple clusters in not done.



PROPOSED SYSTEM:

The proposed system includes solving the problem of how to find polling points and compatible pairs for each cluster. A discretization scheme is developed to partition the continuous space to locate the optimal polling point for each cluster. Then finding the compatible pairs becomes a matching problem to achieve optimal overall spatial diversity. The second problem is how to schedule uploading from multiple clusters. An algorithm that adapts to the transmission scheduling algorithms is included.

The first step in the software development life cycle is the identification of the problem. As the success of the system depends largely on how accurately a problem is identified. At present distributed load balanced clustering algorithm is presented at the sensor

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layer in which the essential operation of clustering is the selection of cluster heads. To prolong network lifetime, it is naturally expected the selected cluster heads are the ones with higher residual energy.

Hence, the percentage of residual energy of each sensor is used as the initial clustering priority. It is also assumed that a set of sensors, denoted by S = {s1, s2, …, sn}, are homogeneous only. Since there is no application with the feature to have heterogeneous nodes in the network and to achieve optimal overall spatial diversity along with schedule uploading from multiple clusters, this project solves the problem through the application. The proposed system has following advantages.

- How to find polling points and compatible pairs for each cluster is studied.
- Partition the continuous space to locate the optimal polling point for each cluster is carried out.
- To achieve optimal overall spatial diversity is carried out.
- Schedule uploading from multiple clusters in done

INITIALIZATION:

In this section the network initialization process (First phase of the algorithm) is carried out. In the initialization phase, each sensor acquaints itself with all the neighbors in its proximity. If a sensor is an isolated node (i.e., no neighbor exists), it claims itself to be a cluster head and the cluster only contains itself. Otherwise, a sensor, say, si, first sets its status as “tentative” and its initial priority by the percentage of residual energy.

Then, si sorts its neighbors by their initial priorities and picks M-1 neighbors with the highest initial priorities, which are temporarily treated as its candidate peers. The set of all the candidate peers of a sensor is denoted as **A**. It implies that once si successfully claims to be a cluster head, its up-to-date **candidate peers would also automatically become the cluster heads, and all of them form the CHG of their cluster**. si sets its priority by summing up its initial priority with those of its candidate peers.

STATUS CLAIM:

In this section status claim process (Second phase of the algorithm) is carried out. In this phase, each sensor determines its status by iteratively updating its local information, refraining from promptly claiming to be a cluster head. The node degree is used to control the maximum number of iterations for each sensor. Whether a sensor can finally become a cluster head primarily depends on its priority.

Specifically, the priority is partitioned into three zones by two thresholds, □h and □m (□h > □m), which enable a sensor to declare itself to be a cluster head or member, respectively, before reaching its maximum number of iterations. During the iterations, in some cases, if the priority of a sensor is greater than □h or less than tm compared with its neighbors, it **can immediately decide its final status** and quit from the iteration.

CLUSTER FORMING:

In this section cluster forming process (Third phase of the algorithm) is carried out. This process decides which cluster head a sensor should be associated with. The criteria can be described as follows: for a sensor with tentative status or being a cluster member, **it would randomly affiliate itself with a cluster head among its candidate peers for load balance purpose**.

In the rare case that there is no cluster head among the candidate peers of a sensor with tentative status, the sensor would claim itself and its current candidate peers as the cluster heads. It calculates the final result of clusters, where each cluster has two cluster heads and sensors are affiliated with different cluster heads in the two clusters. In case a cluster head is running low on battery energy, re-clustering is needed. This process can be done by sending out a re-clustering message to all the cluster members. Cluster members that receive this message switch to the initialization phase to perform a new round of clustering.

RECEIVE PACKET:

In this section during the cluster forming process, received packet steps are carried out. Here what are the nodes in the clusters should be updated as potential cluster heads is decided. Likewise what are the nodes in the clusters should be updated as candidate cluster head peers are decided. In this module, for the given node (A), the nearest cluster heads (NCH) other than the current cluster head (CH) are found out and it can be used for cluster changing by A.

CONCLUSION:

Through this paper mobile data gathering framework for mobile data collection is proposed in a Wireless Sensor Network. 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, use dual data uploading for fast data collection. In the cluster head layer, inter-cluster transmission range is chosen to guarantee the connectivity among the clusters. Multiple cluster heads within a cluster are cooperating with each other to perform inter-cluster communications. Through inter-cluster transmissions, cluster head information is forwarded for its moving trajectory planning. 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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