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Dual Data Uploading and Load Balanced Clustering in Multiple Cluster in WSN

D. Mohanapriya, V. Priyanka
Department of Computer Science and Engineering, Anna University, Anna University, Chennai, India

ABSTRACT

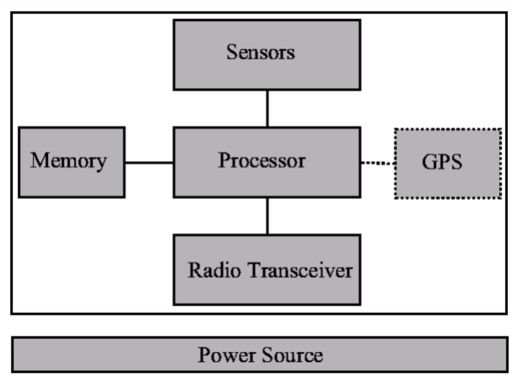
The work proposed a three-layer framework is proposed for mobile data collection in wireless sensor networks, which contains sensor layer, cluster head layer, and mobile collector (called SenCar) layer. The framework employ distributed load balanced clustering and dual data uploading, which is referred 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 anticipated 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 coat, the inter-cluster broadcast range is carefully chosen to guarantee the connectivity between the Multiple cluster heads within a cluster cooperate with each other to perform energy-saving inter-cluster communications. Through inter-cluster broadcast cluster head information is forwarded to SenCar for its moving trajectory planning. At the mobile collector layer, Sen Car is outfitted with two antennas, which enables two cluster heads to simultaneously upload data to SenCar in each time by exploit multi-user Multiple-input and multiple-output (MU-MIMO) technique. The trajectory planning for SenCar is optimized to entirely utilize dual data uploading capability by properly selecting polling points in each cluster.

Keywords : SenCar, WSN, Energy Efficiency, cluster heads, CHG

I. INTRODUCTION

Wireless sensor network are spatially distributed self-sufficient sensors to examine environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively get ahead of their records all in the network to a main location. The modern networks are bi-directional, also enabling control of sensor activity. The enlargement of wireless sensor networks was motivated by military applications such as battlefield surveillance, nowadays such network are used in many industrial and consumer applications, such as industrial process supervise and control, machine health survey and so on.

The Wireless sensor network is built of "nodes" – from few hundreds or even thousands, where each node is coupled to one (or sometimes several) sensors. Each those sensor network node has many parts. A radio transceiver through an internal antenna or connection to an external antenna, a microcontroller, an electronic path for interfacing with the sensors and an energy source, usually a battery or an surrounded form of energy harvesting. A sensor node might vary in size from that of a shoebox down to the size of a grain of dust, while execution "motes" of real microscopic dimensions have yet to be created. The cost of sensor nodes is similarly variable, range from hundreds of dollars, depending on the complexity of the individual sensor nodes. Size and cost constraint on sensor nodes result in equivalent constraints on resources such as energy, memory, computational speed and infrastructure bandwidth. The topology of the WSNs can differ from a simple star network to an advanced multi-hop wireless mesh network. The broadcast technique between the hops of the network can be routing or flooding. Applications of Wireless Sensor Networks are Process Management, Area supervision, Health care monitoring, Environmental/Earth sense, Air pollution monitoring, Forest fire detection, Landslide detection. WSN Provide an overpass between the real physical and virtual worlds. Allow the capacity to observe the previously unobservable at a fine decision over large patio-temporal scales. Have a wide variety of potential applications to industry, science, transportation and civil infrastructure. The below mentioned diagram shows the Basic Components of a WSN Node.



Challenges of WSN is Energy Efficiency, Responsiveness Robustness, Self-Configuration and Adaptation

II. MODULE DESCRIPTION

The following modules are present in the work.

- *Node addition*
- *Battery status update*
- *Initialization*
- *Status claim*
- *Cluster forming*
- *Receive packet*
- *Find optimal spatial diversity*

Node Addition : In this module, the node id, name, initial X and Y Positions details are keyed in and saved in ‘Nodes’ table.

Battery Status Update : In this module, the node id is selected and battery percent is updated. The details are keyed in and saved in ‘Battery Status’ table.

Initialization : In this module, 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 closeness. If a sensor is an isolated node (i.e., no neighbor exists), it claims itself to be a cluster head and the cluster only contain itself. Or else, a sensor, say, si, first sets its status as “tentative” and its initial priority by the proportion of residual energy.

Then, si sorts its neighbors by their initial priorities and picks M-1 neighbors with the highest initial priorities, which ard momentarily treated as its applicant peers. The set of all the candidate peers of a sensor is denoted as A.

It implies that once si successfully claim to be a cluster head, its up-to-date applicant peers would also mechanically become the cluster heads, and all of them form the CHG of their cluster. si set its priority by summing up its initial priority with those of its applicant peers.

Status Claim: In this module, status claim process (Second phase of the algorithm) is carried out. In this phase, each sensor determine its status by iteratively update its local information, abstaining 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 to end with becomes 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, correspondingly before attainment 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 module, 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 module, 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.

Find Optimal Spatial Diversity : 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.

III. 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, 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 alteration of the application. The following enhancements are should be in future. The application if developed as web services, then many applications can make use of the records. Multi -Threading approach can be used so that the cluster forming speed is increased.

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