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Sencar Scheduling Algorithm based on Packet Lifetime in WSN's

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Abstract

Objective: The main scope of this paper is to increase the network life-time and minimizing the data collecting delay in WSNs. **Statistical Analysis:** The simulation is developed by the simulator which contains libraries to design the communication of multimedia packets between sensor nodes in WSN's. **Findings:** A PLBC algorithm is proposed for sensors to coordinate with the SenCar's as per schedule to gather information from nodes within their residual lifetimes. In order to existing methods of clustering, our strategy generates a priority based data gathering from multiple rendezvous points instead of Cluster Heads (CHs) in a network to gather data based on lifetime of a node. At cluster head layer, multiple cluster heads in a network drives data to a polling point to reduce the delay. At SenCar layer mobile collector is armed with multiple antennas, which enables rendezvous point to update dual data simultaneously to mobile collector utilizing a MU-MIMO technique at each time. **Applications/Improvements:** The results of the simulation are obtained and plotted for latency and energy consumption, which can be used to consider the performance.

Keywords: Cluster Heads, PLBC-DDU, Rendezvous Point, Sencar

1. Introduction

WSNs have been applicable in various applications of industries e.g., source detection, patient examining, tide monitoring, etc., which involves an enormous amount of heterogeneous sensor data. The rapid increase in the usage of low-power, low-cost, multi-functional sensors has made WSNs an outstanding data gathering paradigm for deriving local measure of interests. Data gathering plays an important role in WSNs between various sensor nodes, many approaches have been proposed for collecting data. Based on those approaches WSNs have roughly divided in to a framework contains three layers[1]. The primary layer is the enhanced relay routing layer in which data is to transfer between sensors maintaining some factors like load balance, uniform amount of energy, data redundancy and schedule pattern. The second layer coordinates sensors in to clusters and allows cluster-heads to take burden of forwarding data to the data sink. The third layer is SenCar layer which uses a mobile collector to gather data from sensors[2]. Earlier works have authenticated the emergence of WSNs as new information-collecting standards, in which a huge amount of sensor nodes distributed over surveillance field and extract data from the physical environment. The consumption of energy becomes a primary thing in WSNs, as it plays a very important role in the network to usefully operate for a familiar period of time.

Load balanced clustering performs inter-cluster transmissions among cluster heads for energy saving and drive data to sink using SenCar based on dual data uploading in WSNs[3]. In which mobile collector (SenCar) contains multiple antennas for receiving multiple data sensors. Although LBC-DDU performs better compared to previous algorithms in the literature even though it has some demerits. We are proposing priority based distributed load balance clustering-dual data uploading algorithm in WSNs to overcome those demerits. The main motivation is to schedule and coordinate the SenCar's to gather information from sensors based on priority in emergency cases to shorten the latency.

The main augmentation of this work can be summarized as follows. At first, we propose a priority based data gathering technique for multi-hop routing

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protocol to gather data from the multiple rendezvous point in a cluster. Second, in contrast to previous techniques we are gathering data directly from rendezvous point instead of cluster heads which reduces data latency. Third, we deployed a SenCar with multiple antennas allows concurrent uploading of data from the multiple rendezvous point by using MU-MIMO technique. We correlate the SenCar to fully enjoy the benefits of dual data uploading, which fundamentally leads to a data driving tour with both short data uploading time and short trajectory planning.

The purpose of using mobile collectors is to collect data has drawn broadly in recent years. The mobile data gathering statistics in WSNs has various categories:

- Direct Communication Gathering (DCG), in which one or more mobile collectors visit each and every sensor to collect data through single-hop.
- Multi-hop Communication Gathering (MCG), in which the mobile elements visits set of locations and other nodes need to send through a multi-hop routing path[4].

Multi-hop routing describes, a mobile collector visits some areas of the WSNs and transmits their data through a multi-hop routing. Some relevant issues also concerned like data delivery latency, load balancing, and schedule pattern for further improving energy efficiency along with routing. Multi-hop communication further turned into two categories based on amount of data collected:

- Local Data (LD), in which data collects from sensor nodes only.
- Full Data (FD), in which data collects from complete network, is needed.

In local data collection, some agent-based protocols are used to find out the latest locations of mobile collector and then it will construct a perfect routing path from source node to mobile collector via multi-hop communication[5]. In full data collection, always hierarchal structures are introduced to a homogeneous or heterogeneous WSN using recent protocols. To achieve a data gathering latency and load balance between energy consumption. These protocols have divided into three categories: area based, cluster based, and rendezvous based.

Relay routing is a potent and simple approach to forward data from sensors in the remote region using a multi-hop to the cluster heads. HEED algorithm, was proposed that selects CH's periodically according to their residual energy[6]. HuiTian, Hong Shen and Matthew Roughan[7] studied how to place a minimal number of sensor nodes to maximize the coverage area of network when the communicational radius of the sensor nodes is not even less than the sensing radius, which results in the application of efficient topology to WSNs deployment. In this paper, authors deals with collection of mobile data which employs one or more MEs armed with powerful transceivers and batteries[8]. The author's of[9]deals with a system named NIMs, where MEs can only move along fixed cables between trees to ensure that they can be recharged any time during the movement. The author's of[10] proposed a TCBDG algorithm with a mobile sink which employs how Rendezvous Point (RPs) and sub-Rendezvous Point (SRPs) are selected based on traffic loads and hops to root nodes. The author's of[10] proposed a mobile data gathering algorithm with LBC and DDU for self-organization, andadopts inter-cluster communication together for efficient-energy transmission among cluster group heads and uses dual data uploading for fast data collection.

In this approach, at first few rendezvous points are selected for mobile collectors to visit and collect data, which used to bind the length of tour. The source nodes need to associate by their own to the certain Rendezvous Point (RPs) and sends data through a short range communications using mobile collector. Rendezvous points are suitable pause locations for SenCar to visits, data collecting latency and energy consumption should be considered jointly[11].

In this approach, the mobile collector's visits different regions for collecting information which have different effects on the network performance such as reduced data gathering latency and load balance. Sensors in other regions need to forward information to these visited regions through multi-hop.

The authors of[11] proposed EBDC mechanism, to balance the consumption of non-uniform energy of sensor in a region. Similarly, they proposed a cluster based algorithm in WSN with mobile sink, describes collecting of data using mobile sink from cluster head using a routing path in a circular region near buffer area. In network the buffer area has the largest load, to maintain maximal lifetime of network, the important task in the algorithm is to determine the radius of the moving circle of the mobile sink and radius of the buffer area.

2. System Overview

A PLBC-DDU overview is shown in Figure 1 Which includes of three layers: SenCar, sensor, and cluster head layers.

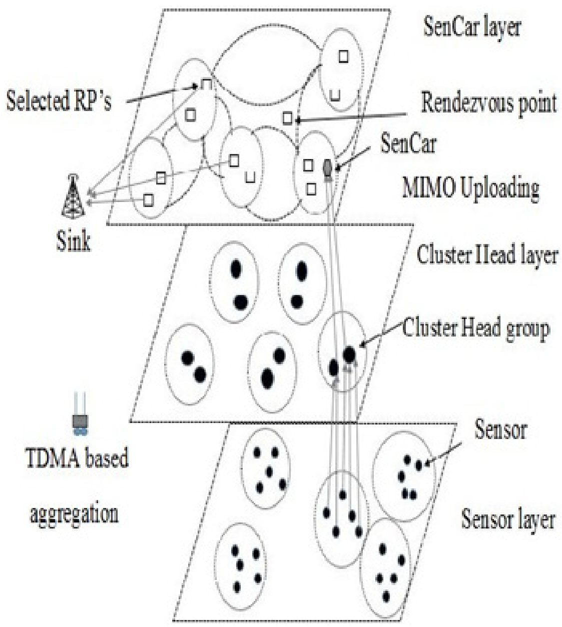

Figure 1. Illustration of PLBC-DDU framework.

Sensor layer is the primary layer. From many attentions, we didn't make any postulations on node capability and distribution. Each and every sensor is postulated to be ready to interact with its neighbor sensors. A group of sensors are organized by own in to clusters during initialization. Each and every sensor makes a decision to be either a CH or a cluster member in a manner. Sensors might have turned out to be cluster heads based on residual energy and each cluster contains multiple cluster heads within in its transmission range called Cluster Head Group (CHG). The algorithm organizes intra cluster aggregation using multi-hop. In the case, sensors are covered by multiple rendezvous point in a cluster network. SenCar layer contains mobile collector which deals with multiple antennas to gather information from multiple rendezvous point at different locations. The data aggregation optionally affiliated with one rendezvous primarily based on priority.

The data aggregation adopts TDMA, to guarantee Quality-of-Services (QOS) and to avoid the collisions during data aggregation. After the formation of CHs, the nodes synchronize their local clocks through a beacon messages based on their highest residual energy[12]. After the synchronization, the existing scheduling scheme adopts the data from different cluster members using intra-cluster forwarding, because the data collected through a SenCar. Some hybrid techniques are used in the case of imperfection, before transmitting to merge TDMA with contention based protocols[4] that listen to the medium are required.

The Cluster Head (CH) layer consists a group of Cluster Heads (CHs) as mentioned before that sends information to the rendezvous point. The only way to send data from group of RP's to SenCar is inter-rendezvous forwarding, which contains a list of multiple rendezvous identification. Such information should be sent before SenCar departs for data collection. The authors' of[12] uses inter-cluster forwarding method in CH layer to transfer data through a SenCar to rendezvous points, which makes a better communication between every CH in the layer.

In our proposed work we used a multi-hop data gathering algorithm at CH layer, which gathers data from various CHs to various rendezvous points directly that, will reduce time latency.

2.1 Priority based load clustering dual data uploading

A group of similar clusters gathered together and made a selection of cluster heads, which used to prolong the lifetime of a network. Cluster heads are naturally expected to have a high residual energy. Based on the percentage of each sensor residual energy, the initialization of clustering priority started. A set of sensors are assumed and denoted by S = {s1,s2,s3…sn} and the weighted count of sensor nodes are assumed and denoted by WC = {w1,w2,w3…wn}, are homogeneous. Inside a SenCar layer each rendezvous point should have accompanied with each and every CH's in the cluster. After running the PLBC algorithm, there is chances of losing the life time of rendezvous in that case the group of CH's will select a sub-rendezvous point which will carry the packets from multiple CH's after initial rendezvous point.

Algorithm 1. Multi-hop data gathering Algorithm

- 1: s1, s2, s3.........sn (Number of Sensor Nodes); w1, w2, w3....wn (weighted count)
- if (s wants to send the data to BS)

{

Select a multi-hop route for data forwarding

}

If (route failed)

{

Again search next available route

}

- RP-->R
- RP can collect data from sensor within its range

If (Energy > Threshold)

{

Send data to RP

}

Else

{

Send to SenCar

}

- SenCar through RP
- Analyze weighted count i.e., w1=30, w2=45,
- w3=50
- Analyze distance from RP to Base station
- [expr sqrt$^{((\$x2-\$x1),2)+((\$y2-\$y1),2)}$]
- Data transfer rate i.e., DT
- Sorting occurs depending on if (WC>max && distance>long&&data rate>higher)
- Depending ranking collector can move and collect data.

3. Performance Appraisal

The performance of our framework was evaluated in this section. Since, the main scope of this paper is to explore collection of data from different rendezvous based on priority using a SenCar. Throughout the paper we have concentrated on two standard parameters. The standard performance parameters are organized as follows:

- Energy consumption and
- Network life time

Figure 2 represents the tour length of SenCar from base station to various rendezvous. We have taken number of polling points on x-axis and length in m x 10^3.

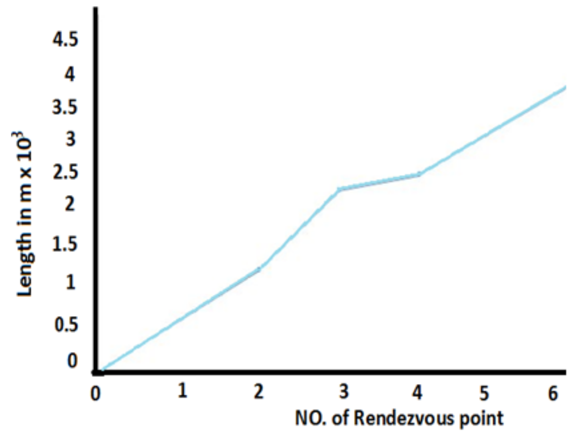

Figure 2. Tour length of SenCar.

The SenCar starts moving from base station to pp1 for collecting data and moves to pp2 due to inter rendezvous forwarding. After collecting data from pp2 SenCar will store data in base station, then it will starts moving from base station to pp3 and do same process of collecting data. Due to that the tour length changes slightly.

Figure 3 represents the energy consumption of SenCar and different rendezvous points. We have indicated energy consumption as j. As it describes all the sensors are consuming uniform amount of energy, hence no packets will lose their energy in a less time.

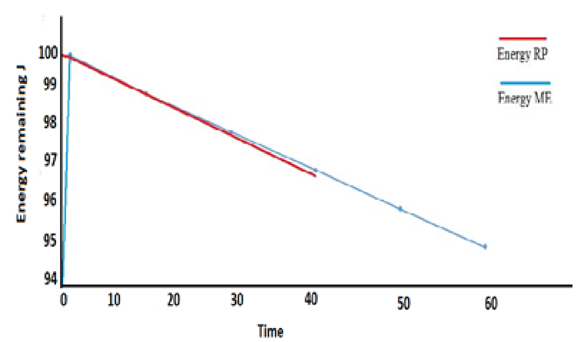

Figure 3. Energy consumption of SenCar and various RPs.

4. Conclusion

In this paper, a PLBC-DDU was proposed for collecting a data from multiple rendezvous point in WSNs. The framework consists of three layers which employs priority based clustering for self-organization, fast data collection the dual data uploading was used. Energy consumption and network lifetime are concerned mostly. The results show that using a multi-hop routing we have reduced the latency of time period and increases the network lifetime.

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