A SURVEY ON MOBILITY MANAGEMENT IN WSN

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Abstract*—A wireless sensor network (WSN) is nothing but the network with sensor devices that can sense environmental conditions about the ambient environment. And Wireless sensor networks (WSNs) have wide range of applications. One of the most important applications is Sensor data collection. The sensor network collects the environment data from all sensor nodes periodically. In this paper a mobile data collection concept is used. The mobile data collector is used to efficiently collecting sensor data with optimized tour. There by reducing the network imbalance and improving network lifetime. Our proposed schedule improves the energy efficiency of sensor data collection. In this method a single hop data gathering algorithm is used.*

Keywords*— *WSN, lifetime, MDC, SHDGP, SDMA, RPS-LBMADC.

1. INTRODUCTION

In WSN sensors are generally scattered into a huge network field without any predefined set. Prior to scanning the environmental parameters, sensors should have capability to find its adjacent sensors and self organization in network. Sensors in WSN have two major jobs which are, sensing the environment and deliver that sensed data to the sink node. [1].The major problem faced in wireless sensor networks is collecting data from all sensor nodes and uploading it to the sink[2].And the data collecting process is the most important thing that is closely related to the network life period. Here the moving data collector initiate the data collection path from the stationary sink and navigate over the network and receive data which is nothing but sensed data from adjacent nodes during navigating, then deliver that aggregated data to static data sink. Since the data collector node is mobile in nature, it moves very near to the sensor node, and if path is well planned then network life span get extended. In this scenario ,life of the network is time span from when the sensors start to deliver data to the sink up to time at which sensors drain their battery[1].

1. Scenario of the Data Collection

In these years various techniques for data aggregation in wireless sensor networks found by the people in research field. In the process of data gathering in wireless sensor networks moving collector and sensors come to know each other when they comes in the range of each other.
Then they start to communicate with each other. In the detection phase of this network, both of them have detected each other through the transmission range. In data transfer state data like ACK or HELLO packets get passed between them when they have detected each other in detection phase. Then after in data routing phase actual data get passed from sensors to the moving collector. The data collection is depicted in following figure 1.

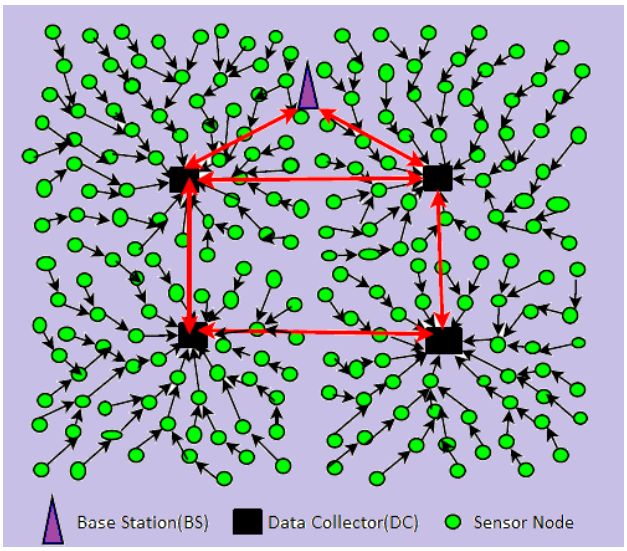

Figure 1: Scenario of the Data Collection in WSN

2. *Important parts of WSN*

a) Sensor Nodes- These are the very basic entities of the wireless sensor networks. These sensors can sense the environment and store it and upload to sink.

b) Static Data Sink- Sink node is very special node with large storage capacity. And it is also called as data gathering node in wireless sensor network. In this sensed data stored and later on which is available to the users.

c) Mobile Data Collector-It is very special type of node with large battery, large storage and large transreceiver capacity.

In this data gathering process the data failure rate get reduced as compare to the data collection with the use of relay nodes by using the mobile data collector. And one

more benefit by using this data collector is energy management.

2. LITERATURE SURVEY

- *Techniques*

A. RELIABILITY NETWORK MODEL

There are two approaches as follows

1. *Centralized Approach:*

In this section, there is a centralized approach [3] which finds a movement strategy of the DCs.

2. *Distributed Approach:*

In this section, a distributed approach used for finding the new locations of DCs. This approach does not require centralized computation[3].Here the distributed approach is scalable compared to the centralized approach.

Advantages

1. Mobile data collector node.
2. Collects aggregate data from sensor node.
3. Increase reliability by sending data to sink by multiple paths.

Disadvantages

1. Increase network traffic by sending packet by multiple paths.
2. No efficient path selection algorithm for data collection from all sensor nodes.

B. Data Collection Using SDMA Technique

In this technique, number of moving collectors is used by network which is called as SenCars in this paper for ease. [4].SDMA is a multiuser multiple-input and multiple-output (MIMO) technique, specifically with multiple receives antennas[4].It enables multiple senders to simultaneously transmit data to a receiver [4].

Advantages

1. Minimizing maximum data gathering time among different regions.
2. Uploading time gets reduced.

Disadvantages

1. Very difficult to decide how many Sensor required to specific region.
2. Costly – Two antennas per car.

C. Wait-Focus-Spray scheme

The WFS technique is also advantageous because it balances data delivery latency and also transmission overhead using the MDCs[5].

Advantages

1. Data delivery scheme in routing layer.
2. Customized forwarding protocol in MAC layer.
3. Reduces delay.
4. Reduce transmission cost.

Disadvantages

1. Multi layer approach. Not robust because change one layer dependant layer not perform as mentioned.
2. N sprays tokens.

D. MDC Based Approaches in WSN

Mobile entities collect data from sensors and deliver it to sink and called as MULES [6]. An analytical model using a random walk mobility scheme was presented. The MULEs are ad-hoc mobile agents like vehicles, animals, etc. that are fitted with transceivers. They showed that, when compared to a plain multi-hop WSN, the energy consumption in the MDC-based approach dropped by a factor of 10 for dense networks and 100 for sparse networks. A naive approach to planning the tour of the mobile agent would be to make it visit each node. Though, in theory, this would achieve minimum possible energy consumption (and hence, maximum possible network lifetime), the data latency will also be maximum [6].

Advantages

1. Reduces the data latency significantly.
2. Packet delay can be reduced significantly.

Disadvantages

1. It is not useful for delay-sensitive applications.

E. Trajectory Based MDC

In hierarchical sensor networks, higher powered relay nodes perform the role of cluster heads. The lifetime of such a network is primarily determined by the lifetime of the relay nodes[7]. In this framework hierarchical network is used and MDC is used for data gathering process. In this ,MDC moves along the set path or trajectory and collects data from every relay node[7].For better performance the length of the trajectory should be

minimized to reduce the size of the buffer and also delay for the data communication.

Advantages

1. Improve the lifetime of the relay nodes and delay between successive visits between nodes.
2. Reduce buffer size requirements.

Disadvantages

1. Cost of computing trajectories.

F. RPS-LB Approach

In this RPS-LB approach, series of Rendezvous Points(RPs) are taken to build the trajectory for the mobile sink and then that moving sink follows the constructed path or trajectory for data gathering process[8].And the derived approximation ratio of the RPS-LB guarantees that the constructed trajectory gives optimal solution[8].

Advantages

1. Eliminate the energy bottleneck.
2. Improves the system applicability

Disadvantages

1. Increased network load.

G. Mobility-assisted data collection (MADC) schemes

In wireless sensor networks (WSNs), one major challenge is how to prolong the network lifetime while maintaining a certain data collection rate for resource-limited static sensors [9]. To achieve this goal, many mobility-assisted data collection (MADC) schemes have been proposed [9].

Advantages

1. Controlled mobility.

Disadvantages

1. Mobile sinks are relatively expensive and can periodically be recharged.

H. MINIMUM ENERGY ROUTING ALGORITHM

In this paper, the problem of constructing a path for a mobile data collecting robot such that the total data collection cost (i.e., sum of transmission energy of the sensor nodes and movement energy of the robot) in a sensor network is minimized [2].

Advantages

1. Heterogeneous communication capabilities.

Disadvantages

1. Approximation factors are quite weak.

I. Single-Hop Data-Gathering Mechanism

In this paper a different data gathering process is proposed for the huge area mainly by improving the scalability parameter of the network with the help of moving data collector in wireless sensor network. In this that collector is called as M-collector for ease. The M-collector has large memory size, large battery and moving capability in it.And that M-collector is also called as mobile robot in this paper[1].The data collection technique referred as SHDGP(that is single hop data gathering problem) [10].

Advantages

1. Improve the scalability and balance the energy consumption among sensors.
2. Improve lifetime of network.

Disadvantages

1. Cost of mobile data collector.

J. Efficient Management for Energy Harvesting Network

The objective of this work is to design a data collection scheme to gather data from sensors at different locations based on their battery states such that network utility is maximized and the data gathering latency is bounded by a predetermined threshold. To achieve this, proposed a two-stage approach. In the first stage, where the SenCar makes stops determined to collect data packets while guaranteeing that the total migration tour length is bounded by a threshold. These node positions are called anchor points in this paper [11]. Sensor nodes with most residual energy are selected as anchor points to maximize the data collected. In the second stage, after the anchor points have been selected, mobile data collection problem formulated under the constraints of flow, energy balance, battery and link capacity. Further, decomposed the convex problem into separate optimization sub problems for data rate, flow routing and sojourn time allocation, and provide distributed algorithm to tackle each sub problem.

Advantages

1. Overall network utility maximized.

Disadvantages

1. Requires position information.

K. Gaussian process model

In this paper the mobility scheduling problem formulated from the informative perspective by using Gaussian process to capture the spatial correlation of real world phenomena [12]. Based on the Gaussian process model and collected sensing data from a number of sensor nodes in the network.

Advantages

1. Improved the quality of data collection tour using mutual information.

Disadvantages

1. Difficult to schedule the mobility of data collector when nodes get increased.

L. Energy replenishment and data gathering (J-MERDG)Model

In this paper a two-step approach for the joint design is implemented to balance the whole energy of the network [13].

Advantages

1. Effectively maintain perpetual network operations and achieve high network utility.

Disadvantages

1. Anchor point selection is more challenging where obstacles exist in the area.
2. Problem of recharging of battery of mobile data collector.

3. CONCLUSION

The sensor network collects environment data from all sensor nodes periodically. In this paper we have discussed the different techniques used for collecting data in wireless sensor networks. The terminology concepts involved in mobile data collection were discussed and some of the advantages and disadvantages were also investigated. To overcome the existing drawbacks we used energy efficient mobile data gathering algorithm.

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