An Optimal Algorithm for Sink Site Scheduling in Wireless Sensor Networks

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Abstract: **In present world, wireless sensor networks (WSNs), is one of the generally growing do research area, that has been involved a lot of research actions going on still today. Mobile phone informal network are attractive very popular in present Wireless equipment, which is be unified to business, in public and in some the crucial applications like armed forces. The network is created by self configuring wireless links which are linked to each other. Sensor Node is equipped with batteries as a one and only energy. Therefore the energy efficiency is critical here in the sensor node. In the earlier issue Sink is static it take more time to scheduling the sensed data travelling around network. The single sink node mobility study has been done with respect of mobility, routing, delay. The paper proposed the ESSDR algorithm is used to reduced delay and the use of multiple sink nodes for further analysis on the sink mobility, direction-finding and delay. With simulation result show that the less delay, more throughput and energy efficiency can be achieved.**

Keywords: Wireless sensor networks, delay-constrained mobility, network lifetime, multihop, sink sites, mobility.

I.INTRODUCTION

A wireless sensor network (WSN) is a fast growing research areas nowadays. WSN is also main applications such as remote environmental monitor and target tracking. This has be enable by the availability, mainly in recent years, of sensors that are smaller, lower, and sharp. These sensors are equipped with wireless interfaces with which they can communicate with one a different to form a network. The design of a application, depends considerably and it must consider factors such as the environment, the application design objectives, cost, hardware, and system constraint.

The sink mobile is classifying into two categories: random mobility based and controlled mobility based the sink is designed to move at random within the network [1]. It take data from sensors when it comes near range in sparse sensor networks. Schemes based on random mobility are straightforward and easy to implement. However, they suffer from shortcomings like uncontrolled behaviours and poor performance [2].

Wireless sensor networks power is the ability to merge large number of tiny nodes which are made to assemble and configure them together. Usage these devices range from real-time tracking, to monitoring of environmental conditions, and also to the computing environments, and equipment. The wireless sensor networks can also control some mechanism that extend control from network space into the physical world.

Some Constraint delays the use of another constraint till a certain amount of time has been expired. In general, use of Sleep in the code is replaced it using to checking other code or programs, which allow the use of maximum time while keeping the tests as fast as possible. Then the modifier is permitted on any constraint, and this delay applies to the entire network till the point where it appeared. Use of a Delayed Constraint without a value is of no use the point of call the value will be extract and also used main delegate and reference. It aso used with polling is nothing but called multiple times it will be without side effects.

The important objective in wireless sensor networks is long network lifetime. Employing a mobile sink is an effective method to achieve this goal. With the mobile sink, the relay nodes around the sink can always be changes with time, which allows a balanced workload and reduces transmission time distance in the sensor nodes.

For the controlled mobility, the problem is the sink must be made to go round the network to get the data. It is a fact that by proper setting the trajectory mobility can be improve the network lifetime. But the mobility also brings some problem, i.e the delay of the data delivery during movement of the sink. Some early methods tried to avoid this problem by taking fast mobility, where the sink speed is very high so that the delay can be reduced. Sometimes this delay-bounded mobility problem gives the heuristics with little theoretical understanding.

The delay-bounded WSNs are introduced to monitor to calculate the surrounding environment maintenance and the data rate of sensors. The systems propose a unique framework that explains the joint sink mobility, data routing, and delay issue. The mathematical formulation is developed based on the framework, which captures different set of issues. But this formulation is a mixed integer nonlinear programming (MINLP) problem and is time consuming to solve it. Hence, instead of solving the MINLP directly, the system finds some induced sub problems i.e. subproblems with zero/infinite delay bound or connected sink sites. The sub problems are solvable and provides an optimal algorithms. Then generalize these solutions and calculate a polynomial-time optimal for the original DeSM problem. The system advances by involving a mobile sink and the impact of network parameters on the network lifetime. The effects of different methods of the sink is to give some idealogy for designing mobility schemes in the present real-world mobile WSNs.

II. ELATEDWORK

Several research works have been going on in the sink sites scheduling in WSNs areas. Most important issues Mobility management are wireless mesh network, vehicular ad hoc network, and so on.

S.R. Gandham, M. Dawande, R. Prakash, and S. Venkatesan proposed one of the main design issues for a sensor network is conservation of the energy available at each sensor node [3]. The system propose to deploy multiple, mobile base stations to prolong the lifetime of the sensor network. The split lifetime the sensor network into equal periods of time known as rounds.

Z.M. Wang, S. Basagni, E. Melachrinoudis, and C. Petrioli proposed exploiting mobility of data collection points for the purpose of increasing the lifetime of a wireless sensor network with energy-controlled nodes [4]. These results verify that energy use vary with the present sink location, being the nodes more exhausted those in the closeness of the sink it's a problem. The proposed solution for compute the sink movement results in a fair comparison of the energy exhaustion between the network nodes.

I. Akyildiz and X. Wang proposed Wireless mesh networks have emerged as a key technology for next-generation wireless networking [5]. Because of their advantages more than other wireless networks, WMNs are undergoing rapid growth and inspiring numerous applications. So many technological issue still be in this field. This object present a full search of here state-of-the-art protocol and algorithms for WMNs.

S. Basagni, A. Carosi, E. Melachrinoudis, C. Petrioli, and Z.M. Wang presented the mobility of a mobile sink in a WSN to prolong the network lifetime. To reduce the data loss during the change of the mobile sink from its current location to its next location, its moving distance must be restricted [6]. The proposed heuristic is nearly best which is similar with the one by solve the MILP formulation but with a great deal shorter running time.

The authors Y.T. Hou present Since energy constraint is a fundamental issue for wireless sensor networks, network lifetime performance has become a key presentation metric for such networks. Problem is two tier wireless sensor network and centre on the flow routing problem for the upper tier aggregation and forwarding nodes (AFNs) [7].

E. Guney, N. Aras, I.K. Altinel, and C. Ersoy, proposed routing and sink site problem sensor networks and propose two new mixed integer programming formulations to decide optimal sink locations and dataflow routes [8]. It propose Lagrange an recreation methods to solve the formulation approximately.

Y.Gu, Y. Ji, J. Li, H. Chen, B. Zhao, and F. Liu presented Recently, sink deployment, in the form of deploy the sink between dissimilar sites so as to power traffic burden. For the choice of sink sites acting a important role in the generally system performance [9].

Y. Yun and Y. Xia proposed a framework to minimize the lifetime of the WSNs by using a mobile sink when the underlying applications delayed information delivery to the sink [10]. The proposed framework, give resolution for make optimization problems that take advantage of the lifetime of the WSN subject to the delay bound constraint, node energy constraint, and flow protection constraint.

Y. Wang, W. Peng, and Y. Tseng propose hybrid WSN with static and mobile nodes. A big dare is how to schedule these mobile sensors travelling paths in an energy-balanced way so that their overall lifetime is maximized [11].

Y. Gu, Y. Ji, H. Chen, J. Li, and A.V. Vasilakos presented a Sink scheduling shown in WSN. This topic suffers from reduced presentation due to lack of joint concern [12]. If there is only one sink develop a polynomial time algorithm to solve it optimally.

G. Keung, Q. Zhang, and B. Li, describes the delay-constrained information coverage problem in mobile wireless networks. Motivated by real application needs, the formulation takes advantage of the node mobility for information collection, which takes place when a node moves into the proximity of stationary base stations [13].

G. Keung, B. Li, and Q. Zhang, presented the message delivery capacity problem in delay-constrained mobile sensor networks. The first time present delay constrained message delivery ability formulation in mobile sensor networks. The objective is to maximize the message delivery capacity subject to the delay and buffering constraints [14].

III. PROBLEM DEFINITION

The sensor network's life span depends on how efficiently the sensor nodes consume energy. In existing scheme, the static sink node and results in the problem. However, the mobility also brings new issue, i.e., the delay of the data deliverance cause by the movement of the sink.

Proposed System Delay-bounded sink mobility is studied, WSNs are deployed to observe the surrounding environment and the data creation rate of sensors can be approximate accurately. By scheduling sink mobility to sink sites, which collect data from sink sites by using DFS and extended ESSDR Algorithm, thus minimises the delay bound problem.

IV. PROPOSED SYSTEM

The proposed system exploits sink mobility to extend the network life span in wireless sensor networks where the data delay cause by moving the sink should be controlled. And also build a joined structure for analyzing this individual sink mobility, routing, delay, and so on.

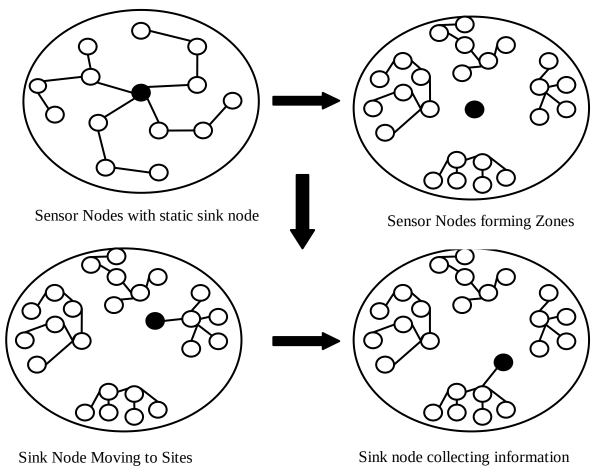

Fig. 1. Architecture of the proposed ystem

Above figure shows that the node with the parameters is set and they are grouped randomly to form a zone. The sink node is not static, after forming the zones called as sink sites, the sink node moves to the particular sink site and stays for some period of time to collect in sequence from nodes in the each group and delivers to destination. Energy is considered as the major constraint in this, and it is concerned with the optimization of energy. DFS is used to find the optimal path for nodes to transmit message to sink node through multihop. ESSDR is used to reduce the delay constrain in the network.

The complete modules have been discussed below.

A. Network Model

To develop this system architecture work from the high level application requirements down through the low-level hardware requirements. This process first attempt to understand the set of target applications and setting up of the wireless sensor network with parameters according to the requirement.

B. Energy Model

Energy Model, as implemented in, is a node attribute. The energy model represents level of energy in a mobile host. The energy model in a node has a first value which is the level of energy the node has at the start of the simulation. This is known as initial Energy. It also has a given energy usage for every packet it transmits and receives. These are called txPower_ and rxPower_.

C. Sink Site

A sink sites are randomly grouping the sensor nodes together to form sites is called sink sites. Here mobile sink moves particular sink site to collect the data. By applying DFS algorithm to each sink site to transmit shortest path to mobile sink to collect data. The sink consists of moving to a maximum speed Vmax (in m/s). sensors will start transmitting data to the sink through multihop routing.

Proposed algorithm for sink sites

The algorithms in three steps are

Step1: Sink moves to particular sink sites and stay a period of time.

Step2: Apply depth first search algorithm for shortest path to collect the data.

Step3: Repeat every site the step1 and step2.

D. Extended SSDR (E-SSDR) Algorithm

The delay-bounded sink mobility problem is study, here find optimal path for mobile sink stays particular sink site collect the data. Apply DFS algorithm to sink sites and use the solved optimally by the SSDR.

Proposed ESSDR algorithm

The proposed algorithm in three steps is

Step1: Divide node into connected subgraphs.

Step2: Apply the Proposed algorithm for sink sites and Euclidian approach to each subgraphs and also obtain the optimal sink path.

Step3: Update the node residual energy.

V. EVALUATION METRICS

The simulation is carried on Network Simulator 2 (NS2) tool; experiment is carried on a simple virtual backbone network for normal packet deliver and compared with virtual backbone network with priority based approach.

Simulation is conducted on NS2 simulation tool of an area 1500m x 1500m, Number of nodes used is 50. Out of which 6 Nodes makes one sink site, and here construct backbone nodes and multiple sink node in each cluster. Type of traffic used is CBR. Below table show the parameters used.

Table 1: Parameters

SL No	Parameters	Values
1	Number of Nodes	50
2	Topology Dimension	1500x1500
3	Traffic Type	CBR
4	Radio Propagation Model	TwoRayGround
5	MAC Type	802.11
6	Packet Size	512
7	Antenna Type	Omni
8	Mobility Speed	250
9	Routing Protocol	AODV

As discussed above, the network is divided into 8 sink sites of 6 sensor nodes each. Sink sites means random grouping sensor nodes to form zones is called sink sites. sink sites sensed data can be send to the moving sink node and receives data and forward to destination.

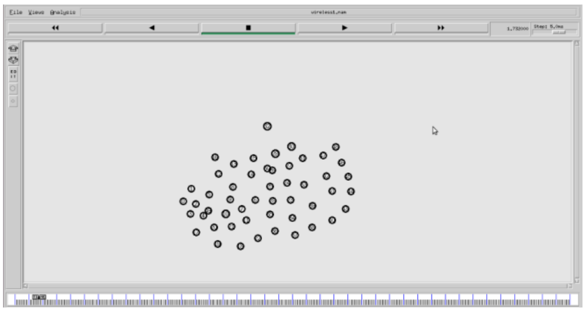

Fig2. Shows the sensor nodes deployed.

Above figure 2 shows the sensor nodes are deployed in tworayground ns2 simulation.

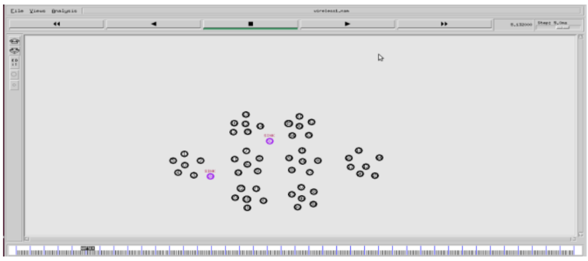

Fig3. Sink sites are created.

Above figure 3 shows that random grouping sensor nodes to form 8 sink sites.

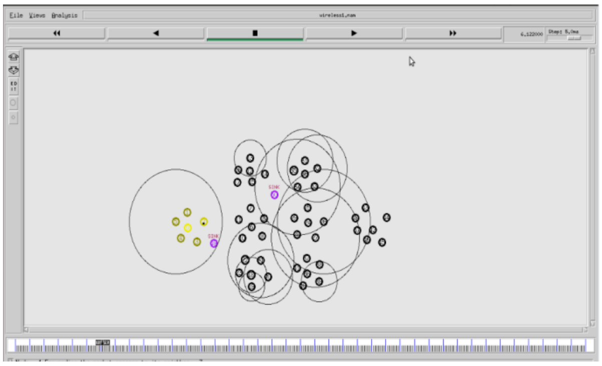

Fig4. Data transmission to the sink node.

As shown in the figure 4 the data is transmitted to the moving sink node, with the less delay.

V. PERFORMANCE ANALYSIS

Below graph figure 5 shows the delay graph it shows the average end to end delay, as the number of nodes increases the delay decreases, packet forwarding opportunity are more, if number of nodes are increased. The x axis shows the time used to scheduling sensed data. Y axis indicates the delay reduced.

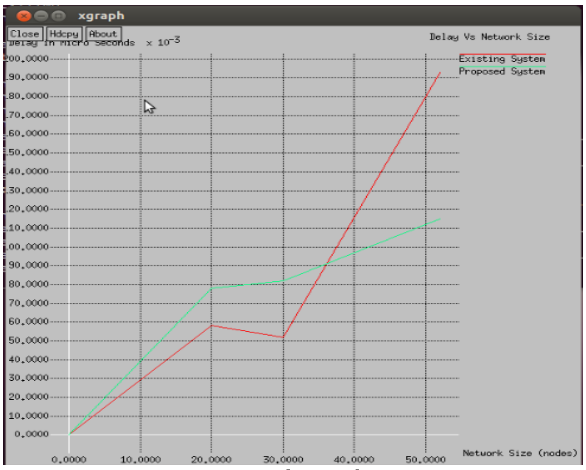

Fig5. Delay graph.

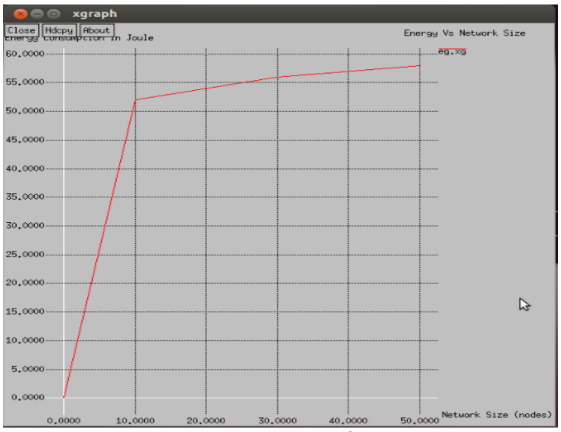

Fig6. Energy graph.

Above graph figure 6 shows Energy graph shows the average energy consumed by the nodes, as the energy is the major constrain in WSN less consumption of energy has to be used, the graph shows that for 50 nodes the average energy is 61.224 joules.

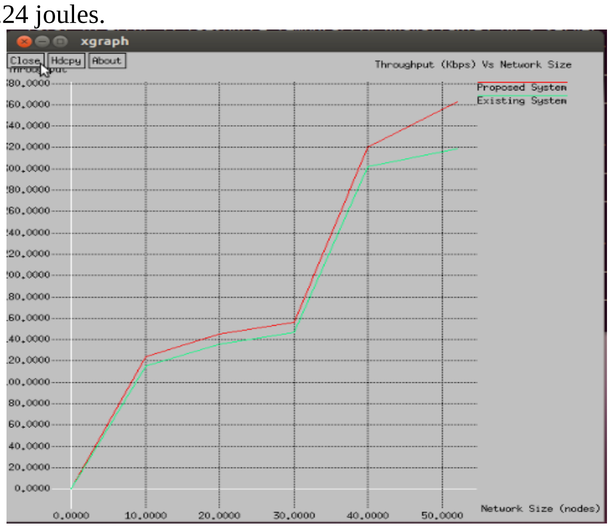

Fig7. Throughput graph.

Above graph figure 7 shows throughput graph, the overall throughput of network in kbps, as the sink nodes increases the packet delivery also increases, below shows the average throughput at different times.

VI. CONCLUSION

This paper has focused on Two tier based sensor network architecture is used to handle query processing in sensor networks. Sink nodes are used in the wireless sensor networks are data gathering and transmission process. Extended Sink Scheduling Data Routing is used to schedule sinks. The scheduling system is modified to maintain multi sink based data collection mechanism. Energy use is minimize in the data collection. The development scheme is suitable for single and multiple mobile sink environment. The proposed system is reduced in the multi sink model. With simulation results show that the less delay, more throughput and energy efficiency can be achieved.

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