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# Heuristic Approach for Network Lifetime Enhancement in Wireless Sensor Networks

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***Abstract***— By using the mobile sink, we can reduce the energy consumption of nodes and to prevent the formation of energy holes in wireless sensor networks(WSNs)and this was mainly used for delay-sensitive applications within a given time constraint. My approach is that mobile sink node only visits rendezvous point (RPs) and this may be opposed to all the nodes. In these sensor nodes not having rendezvous point (RPs) means multi hopping can be done to the nearest RPs.To computing a tour that visits all these RPs.Calculating the optimal tour is an NP-hard problem. To address the problem called as weighted rendezvous planning (WRP)is proposed, there by each sensor node is assigned a weight to its hop distance.WRP is to be validated through computer simulation and our WRP as a mobile sink to retrieve all sensed data within a given time constraint.WRP reduces energy consumption by 22% and increases network lifetime by 44%.

***Keywords—*** Mobile sink, Wireless Sensor Networks (WSN), optimal tour.

## I. INTRODUCTION

WIRELESS sensor networks (WSNs) are composed of a large number of sensor nodes deployed in a field. They have wide-ranging applications, some of which include military environment monitoring, agriculture, home automation, smart transportation and health.Each sensor node has the capability to collect and process data, and to forward any sensed data back to one or more sink nodes via their wireless transceiver in a multihop manner. In addition, it is equipped with a battery, which may be difficult or impractical to replace, given the number of sensor nodes and deployed environment. These constraints have led to intensive research efforts on designing energy-efficient protocols.

In multihop communications, nodes that are near a sink tend to become congested as they are responsible for forwarding data from nodes that are farther away. Thus, the closer a sensor node is to a sink, the faster its battery runs out, where as those leads to nonuniform depletion of energy and results in network partition. As a result, the sink becomes disconnected from other nodes.Here,we can balancing the energy consumption of sensor nodes to prevent energy holes.

Mobile sinks can be used for survey and collect sensed data directly from sensor nodes and may help sensor nodes save energy. Fig. 1 shows the feasible sites of a mobile sink is an example WSN.By changing the position of the sink over time, the forwarding tree will involve a different set of sensor nodes and may help to balance the energy consumption.

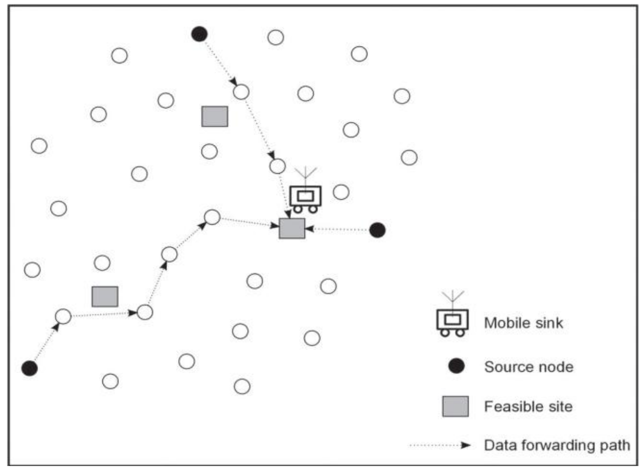


Fig. 1. Example showing a mobile sink performing data collection in a WSN.A source node determines and sends all data to a suitable site

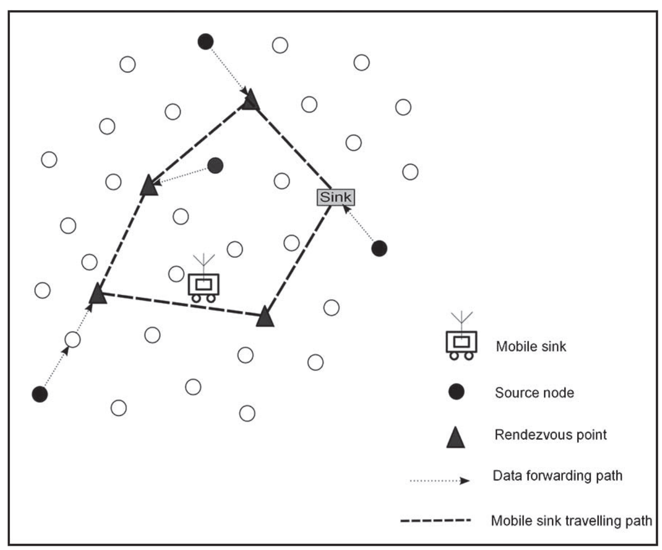


Fig. 2. Hybrid movement pattern of a mobile sink

The path of a mobile sink depends on the real time requirement Of data produced by nodes. For example, such as fire-detection system.However,a mobile sink node may change its position after a few period of time and select another data collection.Basically,the limitations are maximum

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number of feasible sites, maximum distance between feasible sites and govern the movement of a mobile sink.

One major problem is to determine how the mobile sink goes about collecting sensed data. One fundamental approach is to visit each sensor node to receive sensed data directly.Here,the rendezvous point(RPs)is to bound the tour length. We use Weighted Rendezvous Planning(WRP) is to determine the tour of mobile sink and may minimizes the energy consumption of sensor nodes.WRP assigns a weight to sensor nodes based on the number of data packets and selects the sensor nodes with the highest weight.

The remainder of this paper is structured as follows. Section II Delay-aware energy efficient path(DEETP).Section III includes the WRP and Section IV may includes the performance and the conclusion are in Section V.

## II. FORMULATION

Consider a WSN in which sensor nodes generate data packets periodically. Each data packets must be delivered to the sink node within a given time constraint. Before going to DEETP some of the assumptions are

1) The communication time between the sink and sensor nodes is negligible.
2) Each RP node has sufficient storage to buffer all sensed data.
3) The sojourn time at each RP is sufficient to drain all stored data.
4) The mobile sink is aware of aware of the location of each RP.
5) All nodes are connected,and there are no isolated sensor nodes.
6) Sensor nodes have a fixed data transmission range.
7) Each sensor node produces one data packet with length.

Energy incurred when transmitting data is

$E_{TX}(i,j)=b(\alpha 1+\alpha 2xd^{\gamma}_{i,j})$ (1)

✓ d is the physical distance between sensor nodes i and j.

✓ α1 and α2 is the energy consumption factor.

Receiving data is based on energy consumption

$E_{RX}(i,j)=bx\beta$ (2)

✓ β is a factor that represents energy consumption.

Mobile sink node moves with a constant speed v.

$l_{max}=Dxv$ (3)

Therefore, the DEETP is to find a tour such that,the tour is not longer than one and the energy consumption for sensed data.

## III. WEIGHTED RENDEZVOUS PLANNING

WRP designates the sensor nodes with the highest weight as a RP.The weight of a sensor node is calculated by multiplying the number of packets that may forwards by its hop distance to the nearer RP.

$W_i=NFD(i)xH(i,M)$ (4)

✓ NFD(i) is the number of data packets forwarded by node i.

✓ H(i,M) is the Hop distance of node I from the closest RP in M.

Based on this equation (4) sensor nodes are one hop away from an RP and have one data packet buffered get the minimum weight.

After a sensor node is added as an RP, WRP removes those RPs from the tour that no longer receives any data packets from sensor nodes.

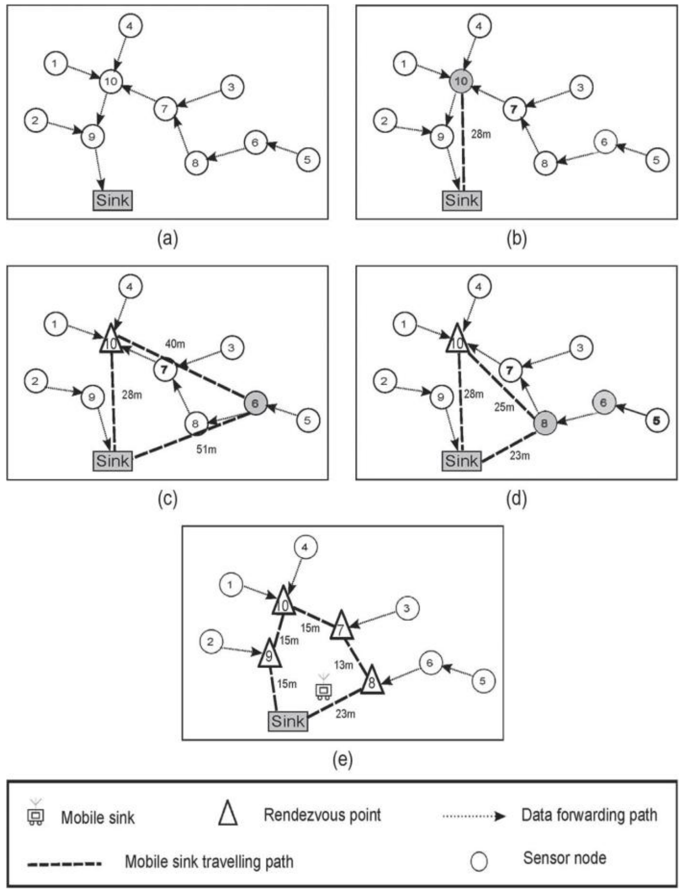


Fig. 3..Example of WRP

WRP always find a tour when there is at least one possible tour in the network. This is that WRP checks the possibility of adding all sensor nodes to the tour. This will be more significant when compared with cluster based and Rendezvous design for variable tracks algorithm.

Theorem 1:

Visiting sensor node with weight reduces energy consumption more then visiting sensor node with weight.

Theorem 2:

Assume a sensor node that has the longest distance from sink and the average hop distance between sensor nodes.

## IV. PERFORMANCE ANALYSIS

Both algorithms yield higher energy consumption when the number of sensor nodes increases as the length of data forwarding paths from sensor nodes increases as the length of data.

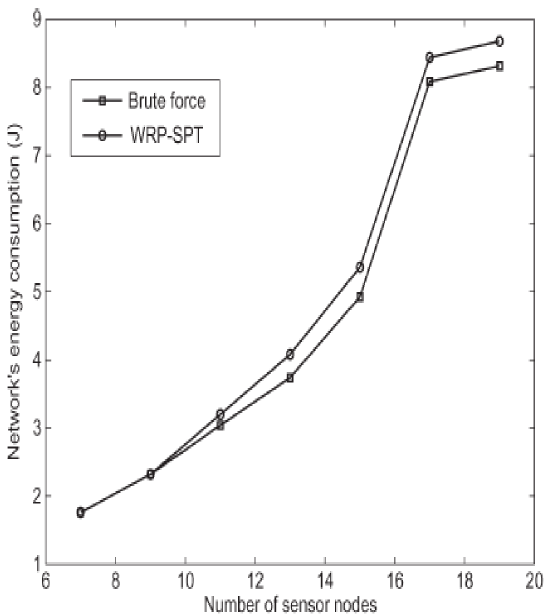


Fig 4. Network energy consumption between brute force and WRP

We use standard deviation (SD) to measure the imbalance between the energy consumption of sensor nodes, i.e., a wide variation means some parts of a WSN is likely to exhaust its energy soon. where EN[*i*] is the energy consumption of node i, V is the set of sensor nodes, and μ is the average energy consumption of sensor nodes. In our evaluation, we consider two scenarios involving an SPT and an SMT for the RD-VT model: RP-UG and WRP.

In WRP, we find the Steiner points and treat them as real nodes. Therefore, Steiner points have some weight and are not replaced with real sensor nodes in the final tour.

## V.RESULT AND DISSCUSSION

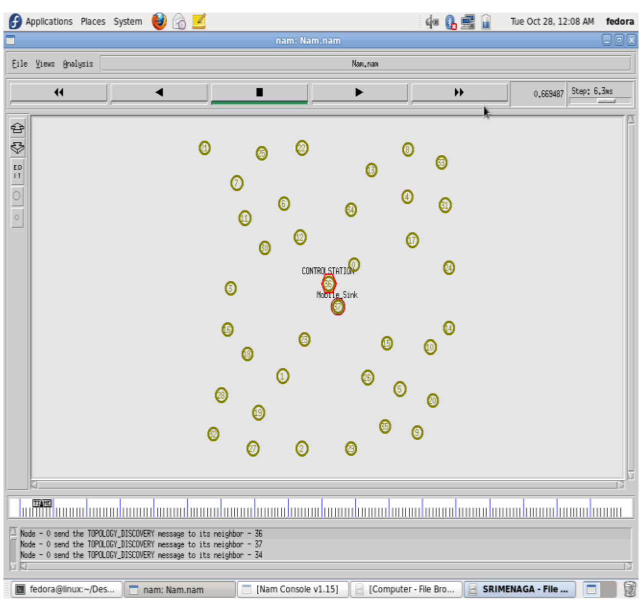

Fig 5.mobile sink and control station was placed

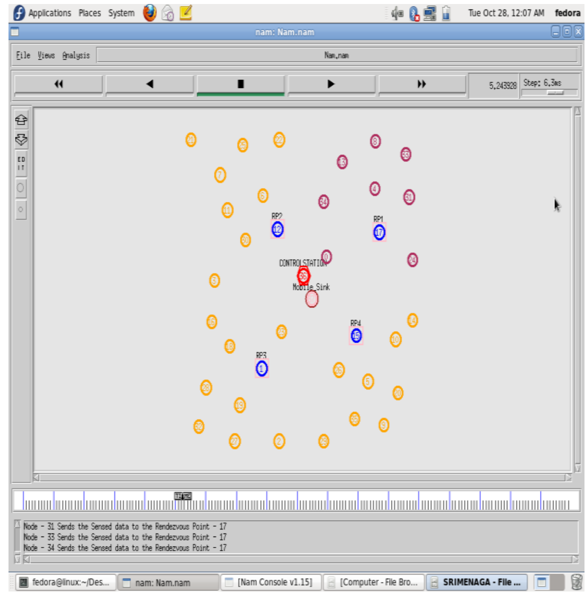

Fig 6.Fix the Rendezvous Points

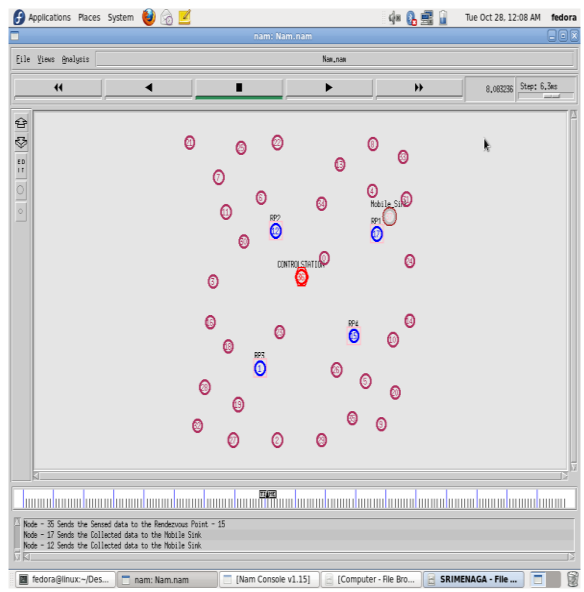

Fig 7.Movable sink can be moved

## VI. CONCLUSION

We plan to enhance our approach to include data with different delay requirements. This means a mobile sink is required to visit some sensor nodes or parts of a WSN more frequently than others while ensuring that energy usage is minimized, and all data are collected within a given deadline. For this purpose we use Multiple Mobile Sink to collect the data efficiently.

Traditionally, a wireless sensor network consists of a fixed sink (or a base station) and hundreds of thousands of tiny sensors powered by batteries. The sensing data generated by sensors can be transmitted to the sink through multihop relays for further processing. Since the sensors are nearer to the sink have to relay data for others, they usually bear disproportionate amounts of traffic and thus deplete their energy much faster than others. Such an unbalanced energy consumption among sensors will shorten the network operational time, data delivery reliability, and other network performance. To mitigate this non uniform energy consumption among sensors, the concept of mobile sinks has been explored.

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