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AN EFFICIENT CLUSTER BASED DATA COLLECTION AND ENERGY AWARE PATH SELECTION IN WIRELESS SENSOR NETWORK

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Abstract: The sensor nodes near to the fixed sink node suffer from the quickly tired energy. For this, many existing methods have been researched to distribute the energy consumption into all wireless sensor nodes using a rechargeable mobile sink. Since the mobile sink changes its location in the network constantly, it has limited time to communicate with the sensor nodes and needs the time to move to each sensor node. Therefore, before the mobile sink approaches the sensor node, the node can collect huge data by event occurrence. It causes the memory overflow of the sensor node and then the data loss. The proposed network is sectioned into a set of sub networks, each of which is called a cluster. In each cluster, one node represents the others and is called the Cluster Head (CH). The objective of the tour building step is to minimize the traveling cost, and therefore it is exactly the anchor point selection algorithm based TSP problem. The proposed algorithm anchor point selection based on a crucial step of the data gathering process since it determines the efficiency of energy transferring and the latency of data gathering. A significant scheme is to simply visit all the sensor nodes, collect data through single-hop transmission and use the mobile sink to forward data back to the static sink through long range communications.

Keywords: Energy Harvesting WSN, Cluster Head, Mobile Sink, Sensor Node.

I.INTRODUCTION

Wireless sensor networks are mostly powered by batteries. Due to limited energy storage capacity of a sensor battery, WSNs can usually remain operational only for a limited amount of time. However, in many applications, such as earthquake, soil monitoring and glacial movement monitoring, due to the harshness of the environment, a long period of unattended operability is required. The mobile wireless sensor networks are much more flexible than the static sensor networks. The advantages of MWSN over the static wireless sensor networks include better and improved coverage, better energy efficiency, superior channel capacity.

Data Collection: Data collection has been an active research area in sensor networks for its ability to reduce energy consumption. Many works have focused on different aspects of data aggregation. Some focus on how to aggregate data from different nodes, some focus on how to construct and maintain a structure to facilitate data aggregation, and some focus on how to efficiently compress and aggregate data by taking the correlation of data into consideration. As this dissertation focuses on how to forward packets to facilitate data aggregation, we brief review protocols for routing packets for data aggregation in current research. These protocols can be classified into two families: cluster-based and tree-based protocols.

Application Of Wireless Sensor Network: Wireless sensor networks have gained considerable popularity due to their flexibility in solving problems in different application domains and have the potential to change our lives in many different ways. WSNs have been successfully applied in various application domains.

- **Area monitoring:** In area monitoring, the sensor nodes are deployed over a region where some phenomenon is to be monitored. When the sensors detect the event being monitored (heat, pressure etc), the event is reported to one of the base stations, which then takes appropriate action.
- **Agricultural sector:** using a wireless network frees the farmer from the maintenance of wiring in a difficult environment. Irrigation automation enables more efficient water use and reduces waste.

II.SYSTEM ANALYSIS

A. **Existing System:** In energy harvesting sensor networks, sensor nodes are able to harvest the energy from the resources available in the environment when their energy gives out due to the data transmission. This makes the required infrastructure and algorithms simple since the lifetime constraint is not a deal as long as the nodes are able

to recharge themselves. A single mobile sink has been used for data collection in delay-tolerant energy harvesting sensor networks. The objective is to determine the optimal possible set of locations in the network at which the mobile sink can visit and collect maximum data from nodes under the time deadline constraint. The deployment of sensor nodes in monitoring emergency situations such as road conditions or earthquake has attracted several research attentions to the data collection paradigm on the direct path. Under this scenario, a mobile sink with fixed mobility pattern is employed to collect the sensed data from the sensor nodes efficiently.

The problem of maximum data collection on a direct path using a mobile sink, the authors define the maximum data collection problem on a time-slotted path by introducing an integer linear programming formulation. The time slot period and having a fixed mobile sink speed, the number of time slots is determined. Furthermore, they consider a fixed value for the time slot period in the definition of ILP. However, considering a fixed value for time slot period does not meet in all scenarios.

Drawbacks

- Mobility based data collection more no of packet drops.
- Infeasible due to the limits of existing road infrastructure and communication power.
- The speed cannot often be changed freely to the purpose of data collection.
- Network lifetime since sensors are powered by energy-limited batteries.
- Decreases as the sensing and reporting rate increases.
- Limited energy supplies, control algorithms must balance the local and external sensing and communication rates.

B. **Proposed System :** The proposed system show an efficient data collection based on cluster and path selection algorithm. The Leach protocol can select the highest residual energy of a node is header. The header node can collect the neighbor node data. The Mobile sink select the best path based on delay value calculation using TSP algorithm on each path. Finally collect the data from each header node to sink.

III. MODULES DESCRIPTION

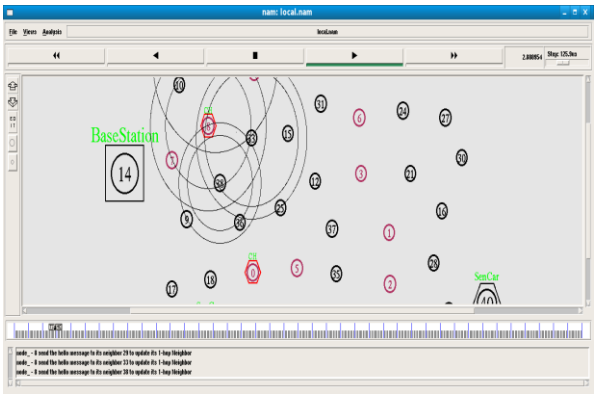
A. WSN Network Model

All sensor nodes are arbitrarily distributed in 2D observing area. The sensor node locations are fixed. Mobile sink nodes can move.When sink nodes are moving, they gather data from the cluster head. When sensor nodes are not in the data gathering range of sink nodes, they store all sensing data in cache and basically are in sleep state. When sensor nodes are in the data gathering range of sink nodes, they are in work state and transmit data to one sink node by direct or multi-hop way.

B. Cluster The Topology Using Leach Protocol

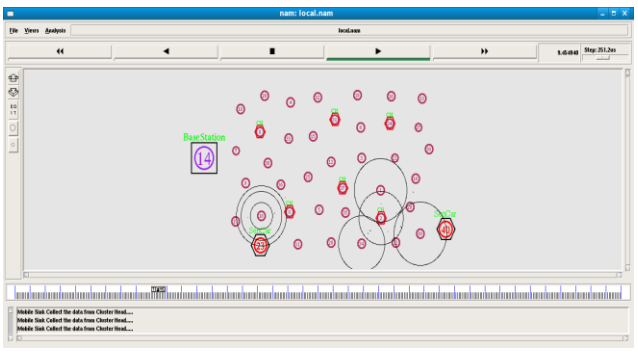
The sensor nodes are gathered into clusters based on its connectivity to each other. In this type of clustering, each cluster signifies a mesh network where each node in a cluster must be located within the communication range of all other nodes in the same cluster. The role of cluster is dynamic which means it rotates to other nodes also in constant round and each node must be designated as cluster-head at-least once.

E-LEACH is the first hierarchical cluster-based routing protocol for wireless sensor network which partitions the nodes into clusters, in each cluster a dedicated node with extra privileges called Cluster Head (CH) is responsible for creating and manipulating a TDMA (Time division multiple access) schedule and sending aggregated data from nodes to the base station.



C. Anchor Point Selection With TSP

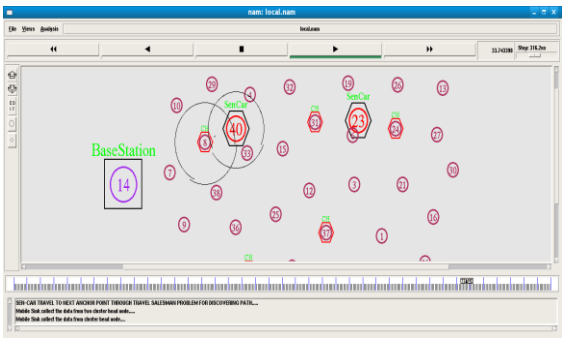
The senors located at the selected anchor points should be those with most urgent needs of energy supplement. The mobile sink moves over the anchor points back and forth for data gatherings during a time interval, the length of each migration tour, which implies the data gathering latency, is expected to be short. To better enjoy the benefit of the energy supply provided by the mobile sink, more anchor points should be selected such that more sensors can timely get recharged. Considering that the possible candidate anchor points are the locations of all the sensors, this problem is equivalent to finding a target sensor. By visiting the locations of all the sensors whose battery energy is less than or equal to that of the target sensor, the length of the shortest migration tour among them is bounded by the threshold.



D. Mobile Sink Data Collection

The aim of data gathering is to transfer data that has been collected by the sensor nodes to the base station. Data gathering algorithms aim to maximize the amount of rounds of communication between nodes and the base station, one

round means that the base station has collected data from all sensor nodes. In data distribution, also other nodes beside the base station can request the data while in data gathering all data is transmitted to the base station. In addition, in data gathering data can be transmitted periodically, while in data dissemination data is always transmitted on demand. Each sensor transmits its data to the CH and once the CH collects all of the data it groups it and transmits it to the BS. Normally the BS is a great distance away, so it will be high energy transmission.



IV.CONCLUSION

Energy Harvesting Wireless sensor networks provide the ability for collecting different types of data at many intervals, even multiple times per second and over huge areas. Data-gathering wireless sensor networks (WSNs) are operated unattended over long time horizons to collect data in several applications such as those in climate monitoring and a variety of ecological studies. The proposed system considers a LEACH model to optimally define the sink and CH locations as well as the data flow in the network. This model effectively utilizes both the position and energy-level aspects of the sensors while selecting the CHs and avoid the highest-energy sensors that are well-located sensors with respect to sinks being selected as CHs repeatedly in successive periods. In future work, it would be worthwhile to use multiple mobile elements rather than using only a single mobile sink, in order to address the problems of buffer overflow, data latency and improve the data delivery ratio. Meanwhile, it is also necessary in this case to explore whether the potential benefit obtained would justify its additional requirements.

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