Opportunistics Routing Algorithm for Relay Node Assortment in Wireless Sensor Networks

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Abstract:- **Wireless Sensor Network (WSN) is a group of intelligent sensors that communicate and coordinate in an energy constrained environment. Due to the narrow energy supply of the sensors, lifetime problems arise in static WSN. One of the potential solutions to this difficulty is a mobility-assisted WSN. Mobility can be introduced by adding extra entities like mobile sinks, mobile cluster-head otherwise mobile relays (MRs) to the existing static WSN. The entities can significantly develop the functionality and performance of the WSN by make it flexible to failures, ease data collection, increase energy efficiency, enhance connectivity, develop coverage and prolong network lifetime. The need of today's applications demands mobility- assisted WSN instead of the traditional static WSN. In this system, control the movement of MRs to maximize network lifetime. A distributed algorithm for controlling the progress of MRs is given and its performance is validated for the network parameters such while network lifetime and average residual energy. The proposed method shows with the purpose of lifetime can be better compare to that of a fixed network.**

***Keywords: WSN, Mobile relays, Network Lifetime, Mobile Cluster Head, and Topology Control*.**

1. INTRODUCTION

A wireless sensor network consists of many nodes commonly communicating by radio waves. The sensors are not integrated into one existing network architecture, hence they communicate through a network of ad hoc wireless connections. The power of both sensor exist provide with a battery, for which individual spending for communication and calculation should be optimized. There are many fields of use for such networks plus monitoring biological, chemical, green and seismic applications, etc. The apply of these sensor networks here hostile environments means to providing quality of service is essential and require the performance of fault-tolerant mechanisms that be able to ensure availability and continuity of service. For example, the most coverage of the regions monitor by the network and connectivity of the various nodes of the network should be maintained. However an environment where each node preserve fail unexpectedly resulting in the isolation of various parts of the network, this guarantee is neither regular nor easy to achieve.

The mixing of mechanisms for surveillance, topology control and fault tolerance are crucial for the efficient use of wireless sensor networks.

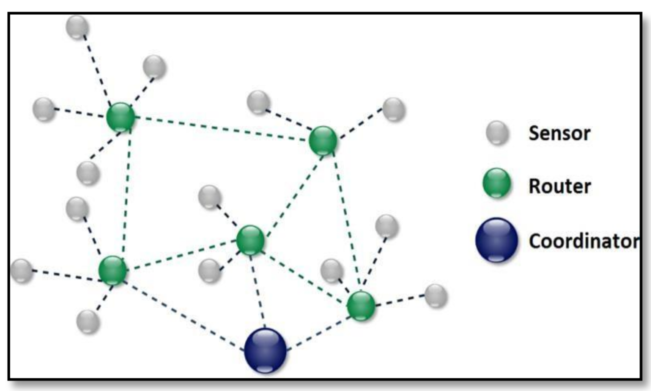

Figure 1: WSN

with a node at low consumption location. Here many mobile sensors change positions once or multiple times. New round starts after first node dies.

2. DIFFERENT METHODS IMPROVE THE NETWORK LIFE TIME

2.1 *Network topology Control*

Network topology determine transmission distances connecting sensors. Different applications include different topology requirements. The sensor nodes communicating through each other use various types of topologies like mesh, tree, chain etc. The main aim of topology control is toward save energy, reduce interference between nodes and extend duration of the network. It minimizes normal delay. In this approach reduce initial topology of network i.e. model network as a (minimum spanning tree) graph. Maintain the communication links among network nodes. Topology control is an iterative process, have, initial, construction and maintenance phase. There are various ways to perform topology construction:

- Change the transmission series of the nodes
- Turn off the nodes since the network
- Create a communication backbone
- Clustering
- Adding new nodes to the network near preserve connectivity

Topology control can be classified based on Direction, Neighbour and Location. It uses different algorithms for extending network's duration like CTCA, A3, and WDTC.

2.2 *Mobility Control*

It is the capability of a network to move without human support. This approach satisfies second requirement of WSN applications. This approach reduces the data delivery latency. It includes following approaches:

1) Mobile Base Station (Sink): In this approach the drop keeps on moving around/inside the sensor field for efficient data collection. Mobile drop increase coverage area, data fidelity, consistency, energy efficiency and throughput. For large scale WSNs, multiple mobile sinks are necessary. For this can use graph-partitioning algorithm. To control the movement of mobile drop require extra sensors for measure speed of node movement and passed distance.

2) Data Mules: Effective intended for delay tolerant networks. Mules are mobile nodes which save data from static sensor nodes, buffer it and shift to the base station. MULEs are referred to as Mobile Ubiquitous LAN extension. Mobile base station and data mules incur high latency near network. Failure of any exacting mule does not disconnect sensor from network, because no sensor depends on any individual mule.

2.3 *Network formation -Clustering*

It is an valuable topology control approach. In cluster base WSN, the entire network is separated into clusters, with each cluster having a Cluster Head through extra privileges and cluster members. Cluster start aggregates data from cluster members and sends it to the sink. Can form cluster dynamically and periodically.

This technique proposed various protocols meant for cluster head selection, cluster formation and data gathering applications.

Can use the cluster head rotation protocol for matching energy consumption among the nodes within the cluster. So the cluster formation takes place only once in network duration to let alone re- clustering. A distributed low complexity clustering algorithm is added suitable for WSN. By this approach reduce energy consumption. Large number of clustering algorithms is present but energy consumption during cluster development and maintenance is still high. Perform role rotation i.e. swap position of cluster leader and cluster member. Cluster based approach introduces more changes to network as each replacement requires new route computation.

3. PROPOSED METHODS

The lifetime of the network is divided into epochs. The Heuristic starts with an initialization phase where the data transport tree is constructed. This is followed by the other two phases Data Forwarding Phase and MRs Movement Phase which is called recursively till the network lifetime is over. In the Data Forwarding Phase, the data is routed to the sink using the next hop node for an epoch. An epoch consists of variable number of data gathering rounds. In the third phase i.e, MRs Movement Phase, a feasible location for the MRs based on energy lessness and over loudness of the nodes are decided. A fitness function is calculated based on the residual energy and load of the node and its neighbors. This is called as the Fitness Index (F-Index). The MRs moves to the location of nodes that are prone to die early. So the MRs stays in the location and performs the duties of that node for the entire duration of that epoch. The MRs is moved to new locations in every epoch till the end of the network lifetime. Initialization Phase: Initially the drop is located at the center of the network area A and the MRs are placed randomly in the network. The minimum hop count value in each node called min- hop is set to infinity and the next-hop node is empty. The sink initiates the initialization phase by transmitting an information-packet to its one-hop neighbors. The information packet format contains senders-id and hop-count .The sink broadcasts the information-packet with its hop-count value set to zero and senders-id as the sink-id to its neighbors. The one-hop neighbors of the sink which receives the information-packet process it and broadcasts it to their neighbors. So the information packet is broadcasted until it is received and processed by all the sensor nodes in the network. Each node that receives an information-packet increments the hop-count value in the received information-packet and compares it with its cached min-hop value, if the hop-count value is less than min-hop value then the node registers min-hop to the hop-count value and stores the next-hop node as the node from which the information-packet was received. Then the node broadcasts a new packet with its min-hop value and senders- id as the nodes-id to its neighbors. Otherwise, if the hop-count value is greater than or equal to the min-hop value, the processing node just ignores the information-packet. In the end, a minimum hop data routing tree routed at sink will be constructed and each node will know the minimum hop node by which it can reach the sink. Data Forwarding Phase: Each node uniformly generates one packet of information during a round. This data-packet is routed to the sink through multi-hop communication by choosing min hop node or the MRs if a node has a MR co-located near it. The pseudo code for data gathering phase during an epoch is, the sink takes the minimum (min) of all the residual energy estimated

MRs Movement Phase: The MRs report to the sink about their location at the end of an epoch. For the next epoch they are instructed by the sink of their new locations. Each node evaluates its health by means of a fitness index (F-Index). This is based on the residual energy that is left over the load that is imposed on it. This can be calculated as sum of load index (LD-Index) and residual energy index (RE-Index). The energy and load of one-hop neighbors are also considered

4. CONCLUSION

The analysis and the simulation results show that adding MRs to a static network definitely improves the performance of a network when compared to a static network. The following conclusions can be derived. Energy is used fairly among all the sensors in the network. Weak nodes which might cause the network lifetime to end are identified and their life is elongated with the help of the MRs. Increase in the number of MRs certainly increases the network lifetime exponentially. Total energy wastage in the network is minimized when compared to the static network. The advantage of using an MR when compared to other mobile entities is, if it fails, the basic network functionalities will still be working, but the network may not avail the services of MR. To conclude the above study, the MRs can definitely be added to a static network to improve the lifetime. Further it can also be used to improve the tracking quality, to keep the network connected, and to improve coverage.

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