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Improving Lifetime of the Wireless Sensor Networks through the Fair Cooperative Routing Method

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ABSTRACT— ***Wireless sensor network is a network composed of a large number of sensor nodes with limited radio capabilities and one or a few sinks that collect data from sensor nodes. Sensor nodes are powered by small batteries; hence, the energy consumption in operating a WSN should be as low as possible. The wireless sensor network present all sensor nodes generate an equal amount of data packets in a WSN, nodes around a sink have to relay more packets and tend to die earlier than other nodes because the energy consumption of sensor nodes is almost completely dominated by data communication rather than by sensing and processing. Therefore, the overall network lifetime can be improved by balancing the communication load at heavily loaded nodes around a sink. This problem is one of the most important issues for WSNs. In this project, the heterogeneity of networks and a fair cooperative routing method is analyzed. To avoid unfair improvement only on certain networks, in this project introduce one or a few shared nodes that can use multiple channels to relay data packets. The sinks and shared nodes can communicate with any WSNs node, different WSNs can use cooperative routing with each other since shared nodes allow sensor nodes to forward data from another WSN as the function of interchange points among respective WSN planes.***

1. INTRODUCTION

Sensor nodes are occupied in a region and it is depicted as wireless sensor network. These nodes have certain principles in case of energy use, carrying out the packets. Due to this each and every work of a node should be useful rather than useless. The energy is backbone of node to sustain the entire network. So the nodes are restricted to perform only negligible work. Nodes are of different nature so nodes should be uniting in behavior to provide a success. Base station acts as bridge between network and the server as in figure1. Routing scenarios are used in terms of protocols and algorithms to enhance the work. The misbehavior of nodes spoils the entire work of the network. In this case the neighbor nodes should

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adjust the network without any defects. This feature is done is determined by affiliated node. This defines the elimination of unfit node. The noticeable point is avoiding the unfit node i.e., critical node by cross checking the next proceeding nodes capability and also the strength between the two consecutive nodes. Sensor network should support as many nodes to join it to perform some communication among it.

Wireless sensor networks (WSNs) are composed of tiny battery-powered sensor nodes that have limited storage and radio capabilities. Therefore, for WSNs to remain operational for a long time, much attention has to be paid to energy consumption in the nodes. In a typical WSN, sensor nodes acquire and send data to a processing center called the sink. Because all data are forwarded to a sink, nodes around the sink tend to transmit many more packets than the others. In this case, the energy of such nodes will exhaust earlier than that of other nodes, causing an "energy hole" to appear around the sink. No more data can be delivered to the sink after the hole appears. Consequently, the energy remaining in the rest of the network is wasted, and the network lifetime is shorter than it could. In some applications, a WSN may comprise several thousand sensor nodes within an extended area (e.g., agriculture and environmental monitoring). In these cases, the diameter of the WSN may be some kilometers. To enable networks to be scalable, a WSN is typically subdivided into clusters and the data collected by cluster heads are sent to a sink. Clustering also supports data aggregation. This is a method by which data from multiple sensors are combined to eliminate redundant information and transmission, thereby reducing energy consumption.

From another point of view, WSNs can be classified into two types, namely homogeneous and heterogeneous sensor networks. In a homogeneous WSN, all nodes have the same capabilities. In recent years, however, heterogeneous WSNs have attracted much attention. These have a small number of "high-end" sensor nodes, with a wider range of radio communication capabilities and/or a larger battery compared with the "normal" nodes. A clustering method to achieve effective use of these high-end nodes has been proposed. However, a clustering method alone is not sufficient to prolong the network lifetime for a heterogeneous WSN, and a clustering and multi-hop hybrid routing method has therefore been proposed. In recent years, multiple WSNs have been constructed within the same geographic area. For such cases, researchers have been investigating cooperation between the WSNs. Some routing protocols for multiple WSNs have been proposed.

2. RELATED WORK

Isabel Dietrich and Falko Dressler reviewed the existing definitions of network lifetime as proposed in the literature. It turned out that most papers – especially those proposing algorithms to increase the lifetime of sensor networks – are built on differing lifetime definitions. They outlined advantages and drawbacks of the existing definitions, and summarized additional requirements. This way, we emphasized the need for a more general and concise definition for accumulated and total network lifetime, that is formal and applicable in various domains. Their new definition of sensor network lifetime is composed in a modular way, allowing incorporating

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different aspects for different application scenarios. The definition comprises metrics that have been used in the literature before, such as node availability, sensor coverage, and connectivity. They also introduced a number of new metrics that we have found to be useful in the context of sensor network applications, including connected coverage, time-integration, and service disruption tolerance.

Apostolos Demertzis and Konstantinos Oikonomou proposed a solution of the energy hole issue using dormant nodes with the same surface density as the traffic load. First, an analytical expression of the traffic load is derived and then a deployment strategy, based on this expression, is developed along with a simple algorithm for the switching among the active-dormant state. The number of required dormant nodes is not insignificant, about 10 times the initial active ones, but the compensation is an improvement of the network lifetime about 50 times. Given that the cost of the wireless sensors must be small, the proposed solution is considered as affordable with respect to the nodes' cost.

Mark Fele gyhazi and Jean-Pierre Hubaux presented a game-theoretic model to study cooperation in multi-domain sensor networks. The limited computation and energy resources of the sensors motivated us to investigate cooperation in the absence of incentive mechanisms. Their results show that the energy saving by cooperation provides a "natural incentive" for the authorities. The benefit of cooperation is twofold: (a) the authorities can have a significant benefit by providing service of their sinks for other's sensor networks and (b) if sinks are common resources, then cooperative packet forwarding is beneficial for sparse networks or if the environment is hostile.

3. FRAMEWORK

A. Overview of Proposed Framework

In this paper, we regarded the heterogeneity of networks and advocate a truthful cooperative routing approach, to avoid unfair development best on sure networks. We introduce one or some shared nodes that can use more than one channels to relay statistics packets. Assuming that sinks and shared nodes can talk with any WSNs here, distinctive WSNs can use cooperative routing with every different since shared nodes allow sensor nodes to ahead information from another WSN because the function of interchange factors among respective WSN planes. When receiving a packet, a shared node selects the path to ship the packet, in line with proposed route choice strategies. This cooperation prolongs the lifetime of every community equally as viable.

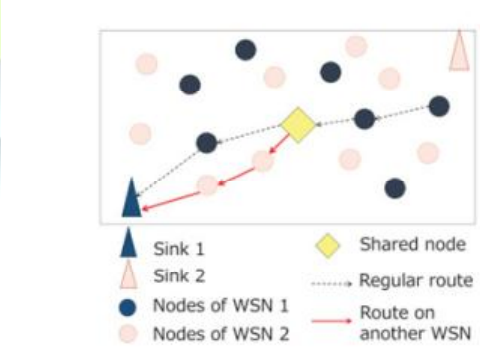

Fig1. System Overview

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Here, the sensor nodes of WSN2 between the shared node and sink1 can forward information packets to sink1 for WSN1 as an opportunity route on every other WSN. However, if the opportunity nodes are also bottleneck of their WSN, the lifetime in their WSN would be shortened. To keep away from this end result, a shared node is capable of select the alternative route handiest if the alternative nodes are not bottleneck. [3] discussed about a system,the effective incentive scheme is proposed to stimulate the forwarding cooperation of nodes in VANETs. In a coalitional game model, every relevant node cooperates in forwarding messages as required by the routing protocol. This scheme is extended with constrained storage space. A lightweight approach is also proposed to stimulate the cooperation.

Route Discovery:

In route discovery, each sensor node discovers its routes not simplest to the sink in its WSN however additionally to all of the other sinks within the specific WSNs for possibilities to forward statistics packets from nodes in unique WSNs to their sink. Therefore, the routing table of each sensor node has m routes similar to each sink in all WSNs.

Obtaining Lifetime Information:

We can obtain the lifetime information when at the time of transmitting a data packet; sensor node adds the values of its network lifetime and route lifetime to the MAC frame header of the packet. If the node does not have any information on network lifetime or route lifetime yet, for instance at the time immediately after creating or updating the route, its own node lifetime is added alternatively. Each node updates this information by overhearing data packets from other nodes. Specifically, when node overhears a data packet, it compares the value of the network lifetime in the data packet and lifetime in its own information, and updates its own lifetime to the smaller value between them.

B. Route Selecting Algorithms

We have two route selecting algorithms for fair routing;

The first one is named Pool-based selecting. We resemble the cooperative forwarding to debt of energy resource. Shared nodes maintain the Energy Pool, the total amount of energy consumption used by cooperative forwarding, continuously. When a node forwards a packet from another network, the Energy-Pool of node is increased and that of another network is decreased. By selecting a route based on the value of Energy-Pool, the cooperation with the fairness of energy consumption is achieved in a heterogeneous environment. In addition, this method is able to balance the energy consumption by cooperation even if each WSN starts to operate from different time.

The other is named Life-based selecting, that selects the route with maximum route lifetime. In contrast to the Energy based route selection that considers only remaining energy on the nodes, Life-based is focusing on the traffic loads by estimating the route lifetime. Therefore, it is expected that the heavy-loaded nodes balance their loads to other network nodes and it leads to a longer lifetime.

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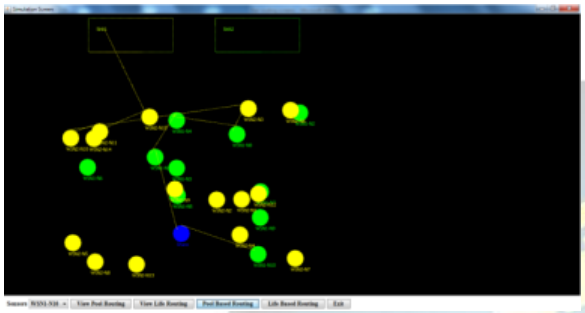
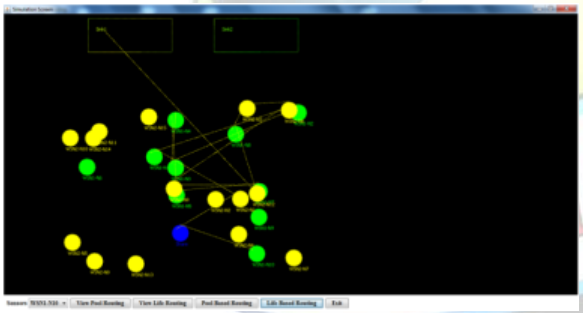
4. EXPERIMENTAL RESULTS

In this experiment we enter the total number of nodes to be created for both WSN1 and WSN2 then select the color for both the WSN nodes.

Pool-based routing simulation:



Life-based routing simulation:



5. CONCLUSION

We proposed a fair cooperative routing method with shared nodes in wireless sensor networks. By using this proposed system we improved all WSNs lifetime by fair cooperative routing in a heterogeneous environment, avoiding improving the lifetime of only certain WSNs. From the experimental results, we proved that the proposed system can effectively improve the network lifetime.

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