Enhance Fair Routing with Resources Flexible Node Allocation for WSN

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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. In this project existing system analysis the heterogeneity of networks and a fair cooperative routing method, 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 WSN 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. When receiving a packet, a shared node selects the route to send the packet, according to proposed route selection methods. This cooperation prolongs the lifetime of each network equally as possible.

Keywords: multiple sensor network; cooperative forwarding; load balancing.

I. INTRODUCTION

Recently, wireless sensor networks (WSNs) have received much attention as a means for collecting and utilizing data from real world. The number of WSN applications has been increasing widely and the application range is expected to spread \cite{1}, \cite{2}. A WSN 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. Generally, sensor nodes are powered by small batteries, hence, the energy consumption in operating a WSN should be as low as possible. Some methods for prolonging network lifetime are required in WSNs \cite{3}. Although 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. Hence, the whole network lifetime can be prolonged by balancing the communication load at heavily loaded nodes around a sink \cite{4}. This issue is called the energy hole problem \cite{5}, \cite{6} and is one of the most important issues for WSNs. There are numerous studies about load balancing for WSNs such as clustering \cite{7}. In addition, as WSNs are diffused widely, multiple overlapping WSNs constructed on the same area become more common. In such a situation, cooperation among the WSNs to prolong network lifetime has been studied \cite{8}–\cite{10}. Assuming that each sink of WSNs has a different location, the heavily loaded area is also different. In this case, cooperation of multiple WSNs may be able to improve the network lifetime of each WSN by load balancing all over the WSNs \cite{11}–\cite{13}. Note that even in a case where multiple WSNs are constructed at the same place, they operate their applications independently and they have heterogeneous characteristic features. However, most of the existing studies do not consider this issue. For instance, if battery capabilities of sensor nodes in each network are different, in order to cooperate in a profitable way, we need to consider some parameters, such as their energy consumption rate, not only their remaining battery. Otherwise, it is possible that certain WSNs prolong their lifetime but others shorten their lifetime. Since their applications are different, data sending interval and/or packet size may be also different. Hence, for fair cooperation, it is necessary to consider the total number of times that the node have forwarded a packet, instead of focusing on each packet forwarding only. Furthermore, operation start time, the number of nodes and/or sensing area of each network may be also different.

II. EXISTING SYSTEM

A. In this project implement to fair routing from select WSN node structure. WSNs operate different applications independently; hence they have heterogeneous characteristics, such as battery capacity, operation start time, the number of nodes, nodes locations, energy consumption, packet size and/or data transmission timing. The existing system results certain WSNs prolong their lifetime, the other WSNs may shorten their lifetime.

B. Drawbacks of existing system

- Synchronization for effective cooperative communications is difficult to achieve especially with multiple PUs.
- The next transmission schedule of PUs for synchronization with SUs is not accurate.
III. PROPOSED SYSTEM

In the proposed system, all the existing system approach is implemented. In addition, for proper scheduling between PUs and SUs, techniques for synchronizing WSN nodes are presented that periodically identifies the suitable SUs for the given PUs and so the sub channel assignment is better than existing system. Best SU Detection algorithm is proposed to avoid the inflation attack which is made by sending false maximum weight among the SUs.

IV. SYSTEM DESIGN

In this subsection, we formulate the overlapped WSNs model for fair cooperation routing. In a sensing field, m different WSNs N1, · · · , Nm are constructed, and each network Ni, 1 ≤ i ≤ m, has a set of unique sensor nodes Ni = {ni1, ni2, . . . , ni|Ni |} and the sink BSi . q Shared nodes s1, . . . , sq also exists in the area. All WSNs are able to use these shared nodes as relay nodes for packet forwarding. For guaranteeing the lifetime improvement by the cooperation, we define network lifetime Li , the estimated lifetime of Ni , is obtained by Eq. (1). Li = min ni j∈Ni Li j (1 ≤ j ≤ |Ni |). (1) Li j is the estimated lifetime of the sensor node ni j here. We call it node lifetime. In other words, the estimated lifetime of a WSN is a minimum estimated lifetime of its all sensor nodes. Each sensor node measures its own energy consumption during specific time τ and calculates Li j by using it. Let ei j t be the remaining energy of node ni j at time t, then, energy consumption per unit time is described by

\[ ei j t = ei j (t+τ) \tau , \]  

and Li j is represented by Eq. (3).

\[ Li j = ei j (t+τ) \tau \]  

\[ ei j t = ei j (t+τ) \]  

By exchanging Li j periodically among neighboring nodes, each node updates Li. In addition, minimum lifetime L0i, the estimated lifetime in the case of no cooperation, is calculated by each sensor node. Specifically, each WSN operates without any cooperation from time t = 0 to t = 0 + τ = τ, and after the duration, L0i is calculated by Eq. (4).

\[ L0i = ei j τ \tau ei j 0 - ei j τ \]  

L0i is also exchanged and updated among sensor nodes. Specific updating procedure of Li and L0i is explained in A shared node sk (1 ≤ k ≤ q), has m routes Ri k l to the sink BSi via network Ni (1 ≤ l ≤ m). Hence, sk selects one of the m routes when sk receives a data packet from network Ni . If i = l, Ni rents the energy resource from Ni l. Moreover, we define route lifetime LRi k l as the estimated lifetime of the route Ri k l . The detailed definition is as follows.

\[ LRi k l = \min n l j \in Ri k l Li j \]  

Eq. (5) means that LRi k l

is the minimum lifetime among the nodes being contained in route Ri k l . To receive live feed of traffic data from the server and a server capable enough to handle the huge processing requirements.

V. ROUTE DISCOVERY

Each sensor node creates its routing table based on a routing protocol. In this paper, we used ad hoc on-demand distance vector (AODV) [19] as a routing protocol, because AODV was developed for wireless ad hoc networks and was adopted for some WSN protocols such as Zigbee [22] and ANT [23]. In route discovery, each sensor node discovers its routes not only to the sink in its WSN but also to all the other sinks in the different WSNs for opportunities to forward data packets from nodes in different WSNs to their sink. Therefore, the routing table of each sensor node has m routes corresponding to each sink in all WSNs. A shared node discovers its route with a slightly different mechanism. A shared node creates m routes via m different WSNs to a sink. There are m sinks, in total, corresponding to m WSNs. Therefore, a shared node has m × m routes. In AODV route discovery, each node chooses a route that has the minimum number of hops to the sink. However, the proposed method uses not the number of hops but a cost calculated by simple accumulation, so that more routes are established via shared nodes. This is because different WSNs can be used only via shared nodes as alternative routes. Specifically, we set 1 as the cost of going through a sensor node and set x(0 < x < 1) as the cost of going through a shared node. When each node discovers a route, it chooses a route that has the minimum cost calculated as the sum of traversing nodes.

Another advantage of the proposed route discovery is that using shared nodes, which have sufficiently large batteries or power supply, is expected to reduce power consumption of other sensor nodes.
As a basic evaluation for heterogeneity, sensor nodes have different battery capacity by a WSN. WSN 1 has the largest capacity and WSN 4 has the lowest. We set the battery capacity of a node in WSN 1 to 1, and the capacity ratio is represented as: WSN1: WSN2: WSN3: WSN4 = 1: 0.75: 0.625: 0.5. Note that each node does NOT need to know the initial capacity of nodes in other WSNs. All each node has to know is its own initial capacity for operating the proposed method properly.

**VII. CONCLUSION**

This paper proposes to extend the generic algorithm and implement the Weight Based Synchronization algorithm to find the winner slot to store the packet data. To extend the Weight Based Synchronization algorithm and implement the Future Peak Detection algorithm to avoid the inflation attack which is made by sending false maximum weight among the nodes. To extend the Future Peak Detection algorithm and implement the Randomized Future Peak Detection algorithm to synchronize all the neighbor nodes by using all the slots.

**VIII. REFERENCES**


