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Collision Avoidance Asymptotic Challenging of Ubiquitous in WSN

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ABSTRACT

In wireless network communication, the energy efficiency is obtained from throughput of data transmission. During the network traffic and failure of data transmission, the energy efficiency and lifetime of network can be reduced in Wireless Sensor Networks (WSN). For this problem, we propose a duty cycling preservation scheme with Enhanced Interior Gateway Routing Protocol (EIGRP). Interior Gateway Routing is used to preserve energy by reducing the network traffic in which the routing decisions are managed on network automatically. It reduces the workload on amount of data needs to be transferred, so the throughput is accomplished by EIGRP for WSN. The EIGRP based on diffused update algorithm to find the shortest path to goal of network. The duty cycling is commonly used for preserving energy effectively. In this process, the cluster heads play a major function in WSN. The aim of this paper is to extend a network lifetime and to preserve the energy by using EIGRP.

Keywords: WSN, Duty Cycling Preservation, Energy, Network Lifetime, Traffic.

1. INTRODUCTION

The plan of cognitive networks was initiate to enhance the effectiveness of spectrum utilization. The basic idea of cognitive networks is to allow other users to utilize the spectrum allocated to licensed users (primary users) when it is not individual use by them. These other user who are opportunistic users of the spectrum are called secondary users. Cognitive radio [1] expertise enables secondary users to dynamically sense the spectrum for spectrum holes and use the same for their communication. A group of such self-sufficient, cognitive users communicating with each other in a multi-hop manner form a multi-hop cognitive radio network (MHCRN). Since the vacant spectrum is shared among a group of independent users, there should be a way to control and manage access to the spectrum. This can be achieve using a central control or by a cooperative disseminated approach. In a centralized design, a single entity, called spectrum manager, controls the procedure of the spectrum by secondary users [2]. The spectrum manager gathers the information about free channels either by sensing its complete domain or by integrate the information collected by potential secondary users in their respective local areas. These users transmit information to the spectrum manager through a dedicated control channel. This approach is not possible for dynamic multi-hop networks. Moreover, a direct attack such as a Denial of Service attack (DoS) [3] on the spectrum administrator would debilitate the network. Thus, a distributed approach is chosen over a centralized control. In a disseminated approach, there is no central administrator. As a result, all users should jointly sense and share the free channel. The information sense by a user should be shared with other users in the network to enable certain necessary tasks like route detection in a MHCRN.

Such control information is broadcast to its neighbours in a traditional network. Since in a cognitive method, each node has a set of channels accessible, a node receives a message only if the message was send in the channel on which the node was listen to. So, to make sure that a message is effectively sent to all neighbors of a node, it has to be broadcast in every channel. This is called entire broadcasting of information. In a cognitive location, the amount of channels is potentially large. As a result broadcasting in every channel causes a large delay in transmit the control information. Another solution would be to choose one channel from among the free channel for control sign exchange. However, the possibility that a channel is common with all the cognitive user is little [4]. As a result, several of the nodes may not be available using a single channel.

So, it is necessary to transmit the control information on more than one channel to make sure that every neighbour receives a copy [5]. With the raise in number of nodes in the system, it is potential that the nodes are scattered over a huge set of channels. As a effect, cost and delay of communications over all these channels increases. A simple, yet efficient solution would be to identify a small separation of channels which cover all the neighbors of a node. Then use this set of channels for exchange the control information. This concept of transmitting the control signals over a selected group of channels as an alternative of flooding over all channels is called selective broadcasting and forms the basic design of the paper. Neighbor graphs and minimal neighbour graphs are introduced to find the minimal set of channels to transmit the control signals.

2. NEED FOR STUDY

In a MHCRN, each node has a set of channels presented when it enters a network. In order to become a part of the network and start communicate with other nodes, it has to initial know its neighbors and their channel information. Also, it has to let other nodes know its occurrence and its accessible channel information. So it broadcasts such information over all channels to make sure that all neighbors obtain the message. Similarly, when a node wants to start a communication it should replace certain control information useful, for example, in route discovery. However, a cognitive network location is dynamic due to the primary user's traffic. The number of available channels at each node keeps changing with time and location. To keep all nodes efficient, the information change has to be transmitted over all channels as quickly as possible [23,24]. So, for successful and efficient coordination, fast dissemination of control traffic between neighboring users is required. So, minimal delay is a important factor in promptly disseminating control information. Hence, the goal is to decrease the broadcast delay of each node.

Now, consider that a node has M available channels. Let Tb be the minimum time required to broadcast a control message. Then, total broadcast delay = M ×Tb. So, in order to have lower broadcast delay we need to reduce M. The value of Tb is dictated by the particular hardware used and hence is fixed. M can be reduced by discovering the minimum number of channels, M ' to broadcast, but still making sure that all nodes obtain the message.

Thus, communications over carefully selected M' channels instead of blindly broadcasting over M (presented) channels is called Selective Broadcasting [1-22]. Finding the minimum number of channels M ' is accomplished by using neighbor graphs and discovering the minimal neighbor graphs. Before explaining the idea of neighbor graph and minimal neighbor graph it is essential to understand the state of the network when selective broadcasting occurs and the difference among multicasting and selective broadcasting.

A. State Of The Network

When a node enter in the network for the first time, it has no information about its neighbors. So, initially, it has to broadcast over all the feasible channels to reach its neighbors. This is called the initial state of the network. From then on, it can begin broadcasting selectively. Network steady state is reached when all nodes know their neighbors and their channel information of each node. Since selective broadcasting starts in the steady state, all nodes are assumed to be in steady state during the rest of the conversation.

B. Multicasting And Selective Broadcasting

Broadcasting is the environment of wireless communication. As a result, Multicasting and Selective broadcasting might appear related, but they change in basic idea itself. Multicasting is used to send a message to a specific group of nodes in a particular channel. In a multichannel environment where the nodes are listening to different channels, Selective broadcasting is an essential way to transmit a message to all its neighbors. It uses a selected set of channels to transmit the information instead of broadcasting in all the channels

3. NEIGHBOR GRAPH AND MINIMAL NEIGHBOR GRAPH FORMATION

In this section, the design of neighbor graph and minimal neighbor graph is introduced and the construction of the same is explain. A neighbor graph of a node represent its neighbors and the channels over which they can communicate. A minimal neighbor graph of a node represents its neighbours and the minimum set of channels through which it can reach all its neighbors. The complete construction of both such graphs is explained below.

A. Construction Of Neighbor Graph

Each node maintains a neighbor graph. In a neighbour graph, each user is represented as a node in the graph. Each channel is represent by an edge. Let graph G denote the neighbor graph, with N and C representing the set of nodes and all possible channels, correspondingly. An edge is added between a pair of nodes if they can communicate through a channel. So a each nodes can have 2 edges if they can use two different frequencies (channels). For example, if nodes A and B have two channels to communicate with each other, then it is represented as shown in Fig. 1a. A and B can communicate through channels 1 and 2. hence, nodes A and B are connected by two edges.

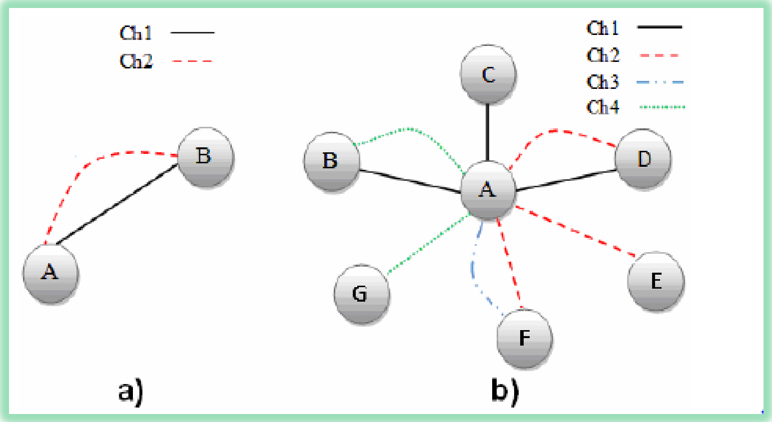

Figure 2. a) Nodes A and B linked by 2 edges. b) Representation of node A with 6 neighbors.

Consider a graph with 7 nodes from A to G and 4 different channels as shown in Fig. 1b. Node A is considered the source node. It has 6 neighboring node, B through G. The edges signify the channels through which A can communicate with its neighbors. For example, A and D node can communicate through the channels 1 and 2. It means that they are neighbors to each other in channels 1 and 2. So this graph is called the neighbor graph of node A. Similarly every node maintains its neighbor graph.

B. Construction Of Minimal Neighbor Graph

To decrease the number of broadcasts, the minimum number of channels through which a node can reach all its neighbours has to be chosen. A minimal neighbor graph contain set of channels. Let DC be a set whose elements represent the degree of each channel in the neighbor graph. So, DCi represents the number of edges corresponding to channel Ci. For example, the set DC of the graph in Fig. 1b is: DC ={3,3,1,2}. To build the minimal neighbor graph, the channel with the highest degree in DC node is chosen. All edges corresponding to this channel, as well as all nodes other than the source node that are associated to these edges in the neighbor graph, are removed. This channel is added to a set called ‘Essential Channel Set’, ECS which as the name imply, is the set of required channels to reach all the neighboring nodes. ECS originally is a null set. As the edges are removed, the corresponding channel is added to ECS.

For example, review the neighbor graph shown in Fig: 1b. The step wise formation of a minimal neighbor graph and the ECS. ECS is set to void. Since channel 1 has the highest degree in DC node, the edges corresponding to channel 1 are removed in the initial step. Also, nodes B, C and D are removed from the graph and channel 1 is added to ECS. It can be seen that sets DC and ECS are reorganized for the next step. This process continues until only the source node is left. At this point ECS contains all the necessary channels. The minimal neighbor graph is formed by removing all the edges from the original neighbour graph, which do not correspond to the channels in ECS. The final minimal neighbor graph is shown in Fig. 2. Since, ECS is constructed by adding only the required channels from C; ECS is a subset of C.

4. OBJECTIVES OF THE STUDY

Therefore, with increase in number of channels the redundant messages approximately increase linearly whereas in selective broadcast the increase is small due to the selection of minimum channel set. In this section, it has been demonstrated that selective broadcasting provides lower transmission delay and redundancy. It should be noted that, due to the decrease in redundancy of messages, there will be less congestion in the network and hence, there is possible for improvement in throughput by using selective broadcasting.

5. LITERATURE REVIEW

B.KANG, N.Kwon, and H.Choo, (2016) “Developing route optimization based PMIPv6 testbed for reliable packet transmission ,” proposed a new algorithm that provides reliable service for MN more accurately. We use the packet sequence number that reduces the forwarding delay time. To evaluate our scheme, we compare with the well-known RO supported PMIPv6 and the OTP scheme via computer simulation and testbed measurement. proposed a new algorithm that provides reliable service for MN more accurately. We use the packet sequence number that reduces the forwarding delay time. To evaluate our scheme, we compare with the well-known RO supported PMIPv6 and the OTP scheme via computer simulation and testbed measurement.

B.Kang and H.Choo, (2016) "A cluster based decentralized job dispatching for the large-scale cloud." proposed a decentralized job dispatching algorithm, designed to be suitable for the large-scale cloud environment. The proposed ICM uses additional Hello packets that observe and collect data. Comparative experimental measurement is carried out to a higher performance than the other three algorithms.

X-Y.Liu et al., (2014) "CDC: Compressive data collection for wireless sensor networks. proposed a novel compressive data collection scheme for wireless sensor networks. This scheme leverages the fact that raw sensory data have strong spatiotemporal compressibility. Our scheme consists of two parts: the opportunistic routing with compression, and the nonuniform random projection based estimation. Prove that this scheme can achieve optimal approximation error, and trace based evaluation show that its error is comparable with the existing method More important, our scheme exhibits good performance for energy conservation.

Y.Gu and T.He, (2011) "Dynamic switching-based data forwarding for low duty-cycle wireless sensor networks." propose a dynamic switch-based forwarding (DSF) scheme for extremely low duty-cycle sensor networks, which addresses the combined effect of unreliable radio links and sleep latency in data forwarding. implemented the DSF in a network of 20 MicaZ motes and performed extensive simulation with various network configurations. DSF significantly improves source-to-sink communication over several state-of-the-art solutions in low duty-cycle sensor networks with unreliable radio links.

X.Xu, X.Y.Li, X.Mano, S.Tang, and S.Wang, (2011) "A delay-efficient algorithm for data aggregation in multihop wireless sensor networks." Data aggregation is critical to the network performance in WSNs and aggregation scheduling is a feasible way of improving the quality. propose a distributed scheduling method with an upper-bound on delay of 16R+_−14 time-slots. This is a nearly constant approximate algorithm which significantly reduces the aggregation delay.

S.Guo, S.M.Kim, T.Zhu, Y.Gu, and T.He, (2011) "correlated flooding in low-duty –cycle wireless sensor networks." propose Correlated Flooding, an energy efficient flooding design for low-duty-cycle WSNs that solves the problem caused by both low-duty-cycle operation and ACK implosion. Correlated Flooding is evaluated in various simulations and a testbed experiment. Results indicate that our design saves more than 66% energy on ACKs and 15% _ 50% energy on data packets for most network settings, while having similar flooding delay and reliability.

Y.Gu, T.He, M.Lin, and J.Xu, (2009) "Spatiotemporal delay control for low-duty-cycle sensor networks." Extremely low duty-cycle sensor networks have been used in many long-term application scenarios with limited power supplies. These networks can not afford to maintain a ready-to-use communication backbone, leading to a potential fragmented connectivity at any given point of time. the effectiveness of our solutions through algorithmic analysis, a running test-bed as well as a 5,000-node simulation. To provide the real-time guarantee of communication delay in extremely low duty-cycle sensor networks.

S.C.H. Hung, P-J.Wan, C.T.Vu, Y.Li, and F.Yao, (2007) "Nearly constant approximation for data aggregation scheduling in wireless sensor networks." Proposed a investigated the data aggregation problem and considered its latency. We used the techniques of maximal independent sets and designed an algorithm of latency $23R+ \Delta-18$. For future work, we describe our short-term, medium term, and long-term goals as follows. Our short-term goal is applying our techniques to directional antennae.

S.Ramanathan and E.L.Lloyd, (1993) "Scheduling algorithms for multihop radio networks." The problems of link and broadcast scheduling for multihop broadcast networks were studied for both arbitrary and restricted networks. New algorithms were given for each case. The performance of our algorithms is superior to existing ones, both theoretically and experimentally. **A** realistic experimental modeling showed that the algorithms described in this paper used, on the average, roughly 8% (10%) fewer slots than did existing link scheduling (broadcast scheduling) algorithms.

6. CONCLUSION AND FUTURE WORK

In this paper the concept of selective broadcasting in MHCRNs is introduced. A minimum set of channels called the Essential Channel Set (ECS), is derived by neighbor graph and minimal neighbor graph. This set contains the minimum number of channels which cover up all neighbors of a node and hence transmitting in this selected set of channels is called selective broadcasting is compared to complete broadcast or flooding. It performs better with increase in number of nodes and channels. It has also been exposed that redundancy in the network is reduced by a factor of (M /M '). As a result there is a possible for improvement in overall network throughput. In complete broadcasting, a node transmits over all its obtainable channels. Since these channels are assign randomly to each nodes, the average number of channels at each node is almost constant. This is because, increasing the amount of channels, the number of neighboring nodes enclosed by each channel also increases. As a result, the minimum channel set required to cover all the neighbors remains constant and keeping the delay constant.

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