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COOPERATIVE COMMUNICATION WITH RELIABILITY CONSTRAINTS IN WIRELESS NETWORKS

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Abstract-It employs receiver cooperation in centralized topology control to improve energy efficiency as well as network connectivity. Receiver cooperation has not previously been considered in topology control. In particular, we show that we can improve both connectivity and energy efficiency if employ receiver cooperation in addition to transmitter cooperation. Cooperative transmission link in wireless networks as a transmitter cluster and a receiver cluster.

Keywords - Ad-hoc network, energy efficiency, multi- hop communications, network connectivity, receiver cooperation, topology control, transmitter cooperation.

I INTRODUCTION

The wireless ad- hoc network has been receiving growing attention during the last decade for its various advantages such as instant deployment and reconfiguration capability. In general, a node in a wireless ad-hoc network suffers from connectivity instability because of channel quality variation and limited battery lifespan. Therefore, an efficient algorithm for controlling the communication links among nodes is essential for the construction of a wireless ad- hoc network. In a topology control scheme, communication links among nodes are defined to achieve certain desired properties for connectivity, energy consumption, mobility, network capacity, security. In this paper, we propose topology control schemes that aim to increase the energy efficiency and the network connectivity simultaneously. In a wireless ad-hoc network, two nodes that are not directly connected may possibly communicate with each other through so called multi- hop communications. By employing multi- hop communication, a node in a wireless ad-hoc network can extend its communication range through cascaded multi- hop links and eliminate some dispensable links to reduce the total required power. Various efforts have been made to study how the links must be maintained and how much power must be associated with each of those links for optimal network operations depending on the situation at hand. For example, Kirousisetal and Clementietal studied the problem of minimizing the sum power consumption of the nodes in an ad-hoc network and showed that this problem is nondeterministic polynomial- time (NP) hard. Because the sum power minimization problem is NP hard, the authors in proposed a heuristic solution for practical ad-hoc networks. Ramanathan and Rosales-Hain, in, proposed two topology control schemes that minimize the maximum transmission power of each node with bi-directional and directional strong connectivities, respectively. When the number of participating nodes is very large, it is crucial to reduce the transmission delay due to multi- hop transmissions. To maintain the total transmission delay within a tolerable limit, Zhang. Studied delay constrained ad-hoc networks and Huang. Proposed a novel topology control scheme in predicting node movement. It was assumed that there exists a centralized system controlling nodes so that global information such as node positions and synchronization timing is known by each node in advance. However, such an assumption can be too strong, especially in the case of ad-hoc networks. For this reason, a distributed approach has been widely considered, where each node has to make its decision based on the information it has collected from nearby neighbor nodes proposed a distributed topology control scheme and proved that the distributed topology control scheme preserves the network connectivity compared with a centralized one. Because the topology control schemes in guarantee only one connected neighbor for each node, the network connectivity can be broken even when only a single link is disconnected. Accordingly, a reliable distributed topology control scheme that guarantees at least k-neighbors was proposed. The result in was extended to a low computational complexity scheme into a mobility guaranteeing scheme into an energy saving.

II. SYSTEM MODEL

In system model considered throughout this paper. It consider a network V≡ {v1,v2,...,vn} consisting of n-nodes that are assumed to be uniformly distributed over a certain region in R2. The nodes are assumed to communicate with one another by transmitting signals over a wireless channel with given bandwidth W. They assume that the physical location of each node does not change with time. To model a practical wireless channel, we assume that the path loss PL (dij) between nodes vi and vj is given by PL (dij) [dB] =PL d0+10k log dij d0+2 log hij + Xσ + c. Here, PL d0 is the reference path loss at unit distance d0 obtained from the free space path loss

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model, and k denotes the path loss exponent that represents how quickly the transmit power attenuates as a function of the distance. The variables dij and hij respectively denote the distance and the randomly varying fast fading coefficient between vi and vj. In addition, Xσ is a random variable introduced to account for the shadowing effect. As assume that hij and Xσ vary independently from packet to packet, but remain constant during each packet duration. Christo Ananth et al. [4] discussed about Reconstruction of Objects with VSN. By this object reconstruction with feature distribution scheme, efficient processing has to be done on the images received from nodes to reconstruct the image and respond to user query. Object matching methods form the foundation of many state- of-the-art algorithms. Therefore, this feature distribution scheme can be directly applied to several state-of- the-art matching methods with little or no adaptation. The future challenge lies in mapping state-of-the-art matching and reconstruction methods to such a distributed framework. The reconstructed scenes can be converted into a video file format to be displayed as a video, when the user submits the query. This work can be brought into real time by implementing the code on the server side/mobile phone and communicate with several nodes to collect images/objects.

Although detailed synchronization techniques are not the main focus of this paper, we briefly describe how the issue of synchronization can be resolved with existing methods. Synchronization techniques have been reported that it can achieve time errors around 3~7μs. At such a level of synchronization, it will become desirable to maintain symbol duration longer than 50μs, which corresponds to symbol rate of up to 20 kilo-symbols per second. A symbol rate of 20 kilo-symbols with rudimentary binary phase shift keying (BPSK) modulation results in a data-rate of only 20 kbps, which is not very high. However, we can employ multi-carrier techniques such as orthogonal frequency division multiplexing (OFDM) to increase the data rate while maintaining or reducing the symbol rate. For example, if we employ an OFDM system

III PROPOSED SYSTEM

The model of cooperative transmission and Receiver, every node on the path from the source node to the destination node becomes a cluster head, with the task of recruiting other nodes in its neighborhood and coordinating their transmissions. Consequently, the classical route from a source node to a sink node is replaced with a multi- hop cooperative path, and the classical point-to-point communication is replaced with many-to-many cooperative communication.

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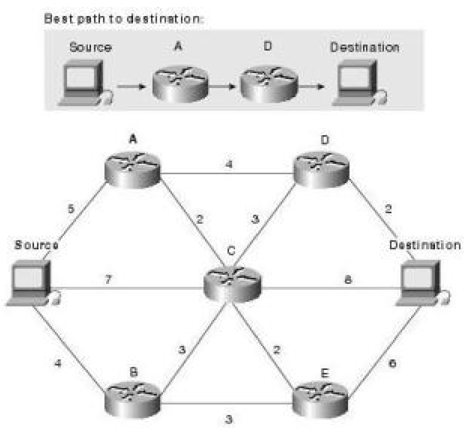
It cooperative transmission protocol consists of two phases. In the routing phase, the initial path between the source and the sink nodes is discovered as an underlying "one- node-thick" path. Then, the path undergoes a thickening process in the "recruiting-and-transmitting" phase.



IV. PERFORMANCE EVALUATION AND NUMERICAL RESULTS

It analyze through simulations the performance of the two proposed centralized topology control schemes, namely, the NCTC and CNTC schemes, and compare them to the NNTC scheme and cooperative topology control scheme in that is based solely on transmitter cooperation. For convenience, we call the topology control scheme in the cluster-to- node topology control scheme (CNTC). To our best knowledge, the CNTC scheme achieves the highest connectivity with a power requirement that is marginally greater than other existing topology control schemes. In this section, we show that the proposed NCTC scheme provides better energy efficiency with marginal connectivity loss and the CCTC scheme allows both better energy efficiency and higher connectivity than the CNTC scheme.

Simulation Configuration

The system performance is evaluated through simulations in this paper. Although analytic evaluation is generally more desirable, the performance of topology control schemes is very hard to analyze. To the best of our knowledge, only some analytical results have been obtained for the case of non-cooperative communications among an infinite number of nodes and previous studies on cooperative topology control schemes have only been evaluated through numerical simulations. For this reason, study the performance through simulations. However, we provide partial analytical reasoning whenever possible. Furthermore, to improve the value of the results, we reflect practical situations as much as possible in simulation configuration by employing channel parameters based on actual field measurement and the design parameters in the 3GPP standard. The system design parameters considered in this section are the number of nodes n, simulation area A, error threshold α_T, packet error function f, and maximum transmit power P_{max}. Parameters n and A are closely related to the node density, which determines the number of nodes participating in the cooperation. Therefore, we varied n and A to observe how the performance is influenced by the node density. The choice of error function f depends on the error correction coding

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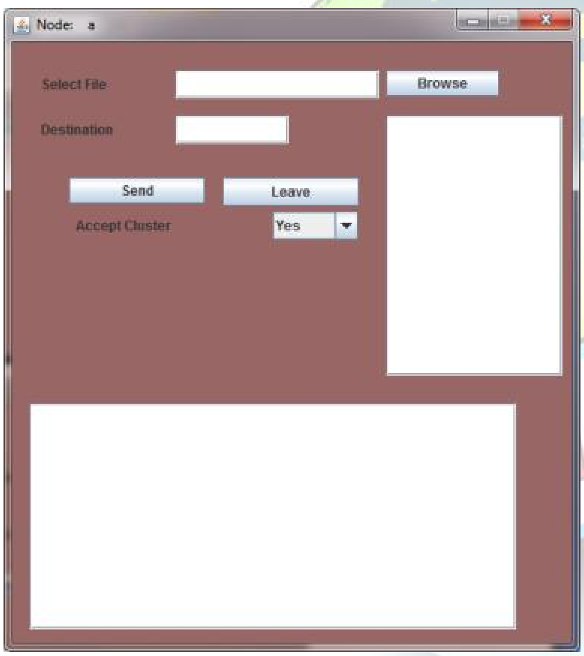
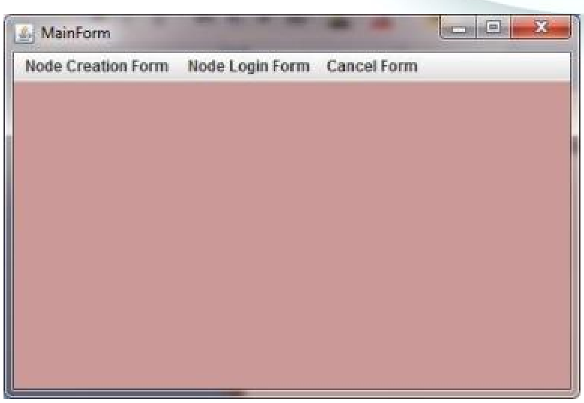
scheme employed. As assume that a convolution code with a constraint length of two is used as the error correction coding scheme with a packet length of 1,024. Hence, we used the actual packet error rate obtained through extensive simulations with the aforementioned convolution code for the packet error function f. For the choice of ατ, It used102, a value often adopted as the target packet error rate in many situations. Finally, we assumed that the node power Pi is limited by P max=250m W, and Pi is uniformly distributed over a 10 MHz bandwidth.





V. CONCLUSION

It evaluated the performance of cooperative transmission, where nodes in a sending cluster are synchronized to communicate a packet to nodes in a receiving cluster. In communication model, the power of the received signal at each node of the receiving cluster is a sum of the powers of the transmitted independent signals of the nodes in the sending cluster.

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