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Selective interpret with eavesdrops for Cooperative Opportunistic Communication in mobile Ad-Hoc routing

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Abstract:
It's been shown that Cooperative Opportunistic Communication (COC) has the possibility to considerably build up the capability of wireless networks. However most of the results are restricted to single-hop wireless networks. To illustrate the advantages of COC in multi-hop wireless networks, we solve a combined optimization problem of relay node assignment and flow routing for concurrent sessions. We analyze this problem via mathematical modeling and solve it using a solution procedure predicated on the branch-and-cut framework. We design several novel components to speed up the computation time of branch-and-cut. Via numerical results, we show the considerable rate gains that may be achieved by incorporating COC in networks.

Index Terms—Cooperative communication, opportunistic routing, opportunistic forwarding, mobile ad hoc networks, proactive source routing, local retransmission, forwarder list update

I. INTRODUCTION

The potential of spatial diversity, in the form of employing multiple antennas, to cope fading in wireless channels has been well recognized. Multiple antennas may be equipped on each individual node in the network (i.e., MIMO) or spread at distinct nodes in the network. On the flip side, distributed antenna systems employing cooperative communications (COC) do not possess this constraint and therefore have got much attention in recent years [5], [6], [7], [11], [15], [17], [18].Under COC, each node comes with only a single antenna and spatial diversity is realized by using the antennas on different nodes within the network.

Within this paper, we illustrate the benefits of using COC in multi hop wireless networks by investigating a combined problem of relay node assignment and multi hop flow routing. The target of this problem will be to optimize the minimal rate among a pack of concurrent communication sessions. For every single session, the information from the source node may need to traverse multiple hops before reaching its destination node. Further, COC might be used along any connection of the road to increase a session's speed. The main problems here are (1) the assignment of relay nodes (either for COC or as a multi-hop relay) to each user session, and (2) the coupling problem of multihop flow routing and relay node assignment.

To answer the situation, we first create a mathematical characterization for concerted relay node assignment and multihop flow routing for a array of concurrent user communication sessions. The problem initially has nonlinear constraints, which we show can be converted in to linear constraints using problem specific properties. Because of this, the closing problem formulation is really a mixed integer linear programming (MILP) problem. We then develop a solution process based on branch-and-cut framework. We propose three novel components that makes the alternative process highly-efficient. First, we develop an efficient polynomial time local search algorithm to create possible flow-routes that work COC along individual hops. Second, predicated on our problem structure, we create a clever strategy to generate cutting planes that substantially reduces the number of branches in our branch-and-cut tree. Third, we present an advanced method of perform branching operations that exploits problem special properties to decrease overall computation time and select superior branches. Our solution procedure provides $(1-e)$-optimal solutions, with being the required approximation error bound.

The remainder of the paper is organized as follows. Section II presents related work. Section III describes how COC work in a model, which will be the fundamental building block for multi-hop study in this paper. In Section IV, we offer a mathematical characterization for joint cooperative relay node assignment and multi-hop routing for a array of concurrent user communication sessions. We also present a problem formulation, with the aim of maximizing the minimum rate among user sessions. In Section V, we formulate a remedy centered on branch-and-cut framework to answer the optimization problem. Section VI presents numerical results to show the rate increases that may be reached by integrating COC in multi-hop wireless networks. Section VII concludes this paper.

II. RELATED WORK

The theory of COC could be traced back again to the pioneering work done by Van Der Meulen [21] and ElGamal [3] and Cover. In [21], Van Der Meulen first introduced the three terminal communication channel (or even a relay channel) and gave capacity bounds for various modes of sending info on this particular channel. Cover and El Gamal [3] examined general relay route and established an achievable lower bound. These early works on relay channels laid the basis for COC.

In recent years, there is growing interest on using distributed antennas for wireless networks, which results in research on COC protocols at physical layer (see e.g., [5],[6], [7], [15], [17], [18]). These physical layer COC protocol shave recently found their application in ad hoc networks, either singlehop networks [2], [19], [23], [25] or multi hop networks [8], [9], [14], [16], [24]. In singlehop networks, the focus has largely been on relay node collection (assignment) between each source and destination pair within the network.

For multihop networks, Khandani et al. [9] analyzed minimal energy routing problem (for just one message) by using both wireless broadcast advantage and COC (called wireless co-operative advantage in the paper). They developed a dynamic programming based option and two heuristic algorithms to get the minimum energy route for just one message. Nevertheless, their approach is restricted to individual messages in the place of streams that we've considered within this paper. In [24], Yeh and Berry planned to generalize the well known maximum differential backlog policy [20] in the context of COC. They formulated a non-linear program that characterizes the network equilibrium area, but only supplied alternatives for a number of simple cases. In [16], Scaglione et al. proposed two architectures for multi-hop concerted wireless networks. Under these architectures, nodes in the network can form multiple cooperative clusters. They showed that the network connectivity could be enhanced by using such concerted clusters. However, problems related with flow routing and relay node assignment aren't the focus for his or her work. In Addition, previous works [8], [14] have proposed heuristics that individually develop routing solutions before addressing relay node assignment for COC. In contrast, this paper considers joint flow routing and relay node assignment for concurrent sessions, and presents a solution with performance guarantee.

III. PROPOSED SOLUTION

For the MILP problem formulation, we formulate a solution process on the basis of the so-called branch - and - cut framework [13]. Branch-and-cut is an improvement of branch-and bound with the so called cutting plane method to deal with integer variables [1], [13]. We further enhance the branch-and-cut framework with various novel problemspecific parts.

In Section V-A, we offer a short overview of the branch-and-cut framework. For a comprehensive understanding of branch-and-cut process, readers are referred to [13]. Then in Section V-B to V-D, we give details on our proposed components to the solution procedure.

A. Algorithm Overview

The branch-and-cut solution procedure consists of a set of iterative steps. During the first iterative step, an upper bound on the objective value is obtained by solving a relaxed version of the MILP problem. Due to relaxation, the values of A_{uv}^{w} and B_{uv} in the solution may become fractional. Therefore, a local search algorithm, called Feasible Solution Construction (FSC), is proposed to obtain a feasible solution from the relaxed solution. The feasible solution obtained from FSC provides a lower bound on the objective value. If the gap between the lower bound and the upper bound is greater than the desired gap (depends upon the value of e), cutting planes are added to the problem. The cutting planes are added to the issue as long as they are improving the upper and lower bounds.

After cutting planes cannot improve the bounds, the issue is branched into two sub-problems. The version of these two sub problems is subsequently solved and FSC is employed to get the lower and upper bounds. The iteration is finished by this step.

After an iteration, in the event the gap between the largest upper bound (among all of the subproblems), along with the greatest lower bound (among each of the subproblems) is a lot more than, yet another iteration step (similar to the opening) is completed on the sub-problem with largest upper bound. Note that after each and every iteration, the subproblem is branched in to two subproblems, increasing the absolute number of subproblems within the device.

The iterations of branch-and-cut continues until the biggest upper bound (among all the current sub-problems) and largest lower bound among all the subproblems (i.e., greatest feasible solution) are in of every other. As of this point, the best feasible solution is -optimal. As one can easily see, the key challenge in implementing a branch - and - cut framework is to build up several problem - specific parts. For our problem, we propose these components.

1) An efficient polynomial time local search algorithm, which we call Feasible Solution Construction (FSC) algorithm. FSC algorithm generates feasible flow-routes that exploit COC along individual hops.

2) Based on our problem structure, we establish a clever strategy to generate cutting planes that significantly decreases the number of branches in our branch-and-cut tree.

3) A helpful approach to perform branching operations that exploits problem specific properties to choose superior branches and reduce overall computation time.

Although the worst case complexity of our solution remains exponential (due to MILP), the actual run time is in fact reasonable. This reasonable running time can be attributed to our proposed new components in the branch-and-cut framework. In the rest of this section, we offer the details for these components.

B. *FSC Algorithm*

After solving the relaxed MILP, the solution may have fractional values for some of the A_{uv}^{w} ’s or B_{uv} ’s, which is clearly infeasible. The proposed FSC is a local search algorithm that constructs a feasible solution based on a given infeasible solution. The algorithm will determine feasible routing, CR assignment, and flow rates for all sessions in the network.

Our proposed FSC algorithm is an efficient polynomial time algorithm, and addresses the solution construction process in three phases, namely, Path Determination, CR Assignment, and Flow Re-calculation. There are number of subtle technical details that need to be addressed in these phases. In the following, we give details on these three phases. We omit the detailed pseudo-code for FSC Algorithm due to paper length limitation.

Phase 1: Path Determination. The goal of this first phase is to find a feasible and potentially high capacity paths for each session in the network. In this phase, our algorithm starts by assuming no prior paths exist for any session in the network. Among the sessions whose paths are yet to be determined, the algorithm performs path determination for a session (chosen at random) iteratively.

When determining the next-hop node, we take the following approach. Suppose we are searching the next hop node for a node r_i. In the relaxed solution, it is possible that

IV. NUMERICAL RESULTS

In this section, we present some numerical results to demonstrate the rate gains that can be achieved by jointly optimizing relay node assignment and flow routing in multi-hop wireless networks. We also compare the results under our solution with that when COC is not used.

A. *Simulation Setting*

In our simulations, we set W = 22 MHz bandwidth for each channel. The maximum transmission power at each node is set to 1 W. For simplicity, we assume that h_{sd} only includes the propagation gain between nodes s and d and is given by $|h_{sd}|^2 = \|s-d\|^{-4}$, where ||s−d|| is the distance (in meters) between nodes s and d and path loss index is 4. For the AWGN channel, we assume the variance of noise is $10^{-10}W$ at all nodes. For our $(1-e)$ -optimal solution, we set e =0.1 in all cases.

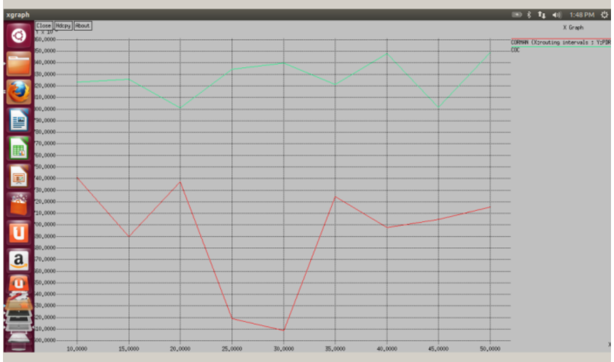

Fig. 1. Routing simulation model

V. CONCLUSION

In this paper, we demonstrated the benefits of utilizing COC in multihop wireless networks by performing combined optimization of combined relay node assignment and multi-hop flow routing for concurrent sessions. This optimization problem is inherently difficult as a result of the mixed integer nature and very substantial problem space. To answer the problem, we developed an efficient solution procedure based on branch-and-cut framework with different novel components to hasten the calculation. Our results showed the significant rate increases that may be reached by incorporating COC in multi hop wireless networks.

For future work, we believe that many increased models such as those described in [10] could be explored in context.

REFERENCES

[1] M.S. Bazaraa, H.D. Sherali, and C.M. Shetty, Nonlinear programming:Theory and algorithms, 3rd edition. Wiley, New York, 2006.

[2] J. Cai, S. Shen, J. W. Mark, and A. S. Alfa. Semi-distributed userrelaying algorithm for Forward-By-Augmentwireless relay networks.IEEE Transactions on Wireless Communications, 7(4):1348–1357, April2008.

[3] T.M. Cover and A.E. Gamal. Capacity theorems for the relay channel.IEEE Transactions on Information Theory, 25(5):572–584, 1979.

[4] M.R. Garey and D.S. Johnson. Computers and Intractability: A Guideto the Theory of NP-Completeness. W.H. Freeman and Company, NewYork, 1979.

[5] D. Gunduz and E. Erkip. Opportunistic cooperation by dynamic resourceallocation. IEEE Transactions on Wireless Communications, 6(4):1446–1454, April 2007.

[6] O. Gurewitz, A. de Baynast, and E.W. Knightly. Cooperative strategiesand achievable rate for tree networks with optimal spatial reuse. IEEETransactions on Information Theory, 53(10):3596–3614, October 2007.

[7] T.E. Hunter and A. Nosratinia. Diversity through coded cooperation.IEEE Transactions on Wireless Communications, 5(2):283–289, February2006.

[8] G. Jakllari, S.V. Krishnamurthy, M. Faloutsos, P.V. Krishnamurthy, andO. Ercetin, A cross-layer framework for exploiting virtual MISO linksin mobile ad hoc networks. IEEE Transactions on Mobile Computing,6(5):579–594, June 2007.

[9] A.E. Khandani, J. Abounadi, E. Modiano, and L. Zheng. Cooperativerouting in static wireless networks. IEEE Transactions on Communications,55(11):2185–2192, November 2007.

[10] G. Kramer, I. Maric, and R.D. Yates, Cooperative communications.Foundations and Trends in Networking, Now Publishers, June 2007.

[11] J.N. Laneman, D.N.C. Tse, and G.W. Wornell. Cooperative diversity inwireless networks: efficient protocols and outage behavior. IEEE Transactionson Information Theory, 50(12):3062–3080, December 2004.

[12] F. Li, K. Wu, and A. Lippman. Energy-efficient cooperative routing inmulti-hop wireless ad hoc networks. In Proc. 25th IEEE InternationalPerformance, Computing, and Communications Conference, pages 215–222, April 10–12 2006.

[13] Y. Pochet and L.A. Wolsey, Production Planning by Mixed IntegerProgramming. Springer, New York, 2006.

[14] S. Lakshmanan and R. Sivakumar, Diversity routing for multi-hopwireless networks with cooperative transmissions. In Proceedings ofIEEE SECON, Rome, Italy, June 22–26, 2009.

[15] S. Savazzi and U. Spagnolini. Energy aware power allocation strategiesfor multihop-cooperative transmission schemes. IEEE Journal onSelected Areas in Communications, 25(2):318–327, February 2007.

[16] A. Scaglione, D.L. Goeckel, and J.N. Laneman. Cooperative communicationsin mobile ad hoc networks. IEEE Signal Processing Magazine,23(5):18–29, September 2006.

[17] A. Sendonaris, E. Erkip, and B. Aazhang. User cooperation diversity– part i: system description. IEEE Transactions on Communications,51(11):1927–1938, November 2003.

[18] A. Sendonaris, E. Erkip, and B. Aazhang. User cooperation diversity– part ii: implementation aspects and performance analysis. IEEETransactions on Communications, 51(11):1939–1948, November 2003.

[19] Y. Shi, S. Sharma, Y.T. Hou, and S. Kompella. Optimal relay assignmentfor cooperative communications. In Proceeding of ACM MobiHoc, pages3–12, Hongkong, China, May 27–30 2008.

[20] L. Tassiulas and A. Ephremides. Stability properties of constrainedqueueing systems and scheduling policies for maximum throughput inmultihop radio networks. IEEE Transactions on Automatic Control,37(12):1936–1948, 1992.

[21] E.C. van der Meulen. Three terminal communication channels. Advancesin Applied Probability, 3:120–154, 1971.

[22] V.V. Vazirani. Approximation Algorithms. Springer Verlag, Berlin,Germany, 2001.

[23] B. Wang, Z. Han, and K.J.R. Liu. Distributed relay selection andpower control for multiuser cooperative communication networks usingbuyer/seller game. In Proc. IEEE INFOCOM, pages 544–552, Anchorage,Alaska, May 6–12 2007.

[24] E.M. Yeh and R.A. Berry. Throughput optimal control of cooperativerelay networks. IEEE Transactions on Information Theory, 53(10):3827–3833, October 2007.

[25] Y. Zhao, R. Adve, and T.J. Lim. Improving Forward-By-Augmentrelaynetworks: optimal power allocation versus selection. In Proc. IEEEInternational Symposium on Information Theory, pages 1234–1238,Seattle, USA, July 9–14 2006.