

A Result Analysis of Bandwidth-Aware High-Throughput Routing with Successive Interference Cancellation in Multihop Wireless Networks

Neha Ransurma¹, Prabhat Sharma²

M.Tech Scholar, Department of ECE, Oriental Institute of Science & Technology, Bhopal, M.P., India¹

Professor, Department of ECE, Institute of Science & Technology, Bhopal, M.P., India²

ABSTRACT: In Wireless Mesh Network (WMN) has become a vital edge network to produce net access to remote areas and wireless connections during a metropolitan scale. During this paper, we tend to study the matter of identifying the most offered bandwidth path, a basic issue in supporting quality-of-service in WMNs. because of interference among links, bandwidth, a well known bottleneck metric in wired networks, is neither concave nor additive in wireless networks. During this paper, we tend to target the planning of bandwidth-aware routing protocol with sic, aiming at achieving high overall end-to-end output. we tend to develop an sic able condition for a routing protocol to spot useful sic opportunities that improve spatial reuse while not impacting transmission quality. Successive interference cancellation (SIC) is an efficient methodology of multipack reception (MPR) to combat interference at the physical layer. To understand the potential MPR advantages, we tend to tend to check link designing in unplanned networks with set at physical layer. The particular fact that the links detected consecutive by set are associated with at the receiver poses key technical challenges.

KEYWORDS: Multihop Wireless Networks, Successive Interference Cancellation, Routing Metric, Available Bandwidth.

I. INTRODUCTION

Interference could be a basic impediment to the general output of a wireless network. Because of the broadcast nature of wireless media, wireless transmissions within the same neighborhood can interfere with one another. So as to reduce interference, transmissions during a wireless network ought to be separated by a precise network resource (e.g., space, time slots, frequencies, or codes). It's important to develop efficient protocols, like routing protocols, multiple access protocols, and physical techniques, to higher utilize network resource and combat the impact of interference. Superposition code (SC) and sequent interference cancellation (SIC) are well-known physical layer techniques [10]. The former permits synchronic unicast transmissions from one sender to multiple receivers, and additionally the latter permits synchronic unicast transmissions from multiple senders to 1 receiver. Further specifically, signals are mixed on the physical layer, either due to the one sender activity the superposition coding, or the multiple senders' transmission at a similar time. Once receivers receive the signal, they apply successive interference cancellation to rewrite information destined for them. successive interference cancellation (SIC) [1] is also a promising physical layer technique to combat interference, that permits the receiver to either half cancel the busy signals or receive over one desired signal at a time [2]. With SIC, the links originally busy with each other is additionally able to transmit at a similar time, thereby raising the data measure efficiency and special utilize. Theoretical analyses [3] have verified the effectiveness of set on. Besides, efforts are dedicated to capturing the results of set on among the design of Medium Access control (MAC) layer protocols. A wireless mesh network (WMN) consists of a large variety of wireless nodes. The nodes kind a wireless overlay to hide the {service area} whereas some nodes are wired to the net. As a part of the

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net, WMN has got to support diversified multimedia system applications for its users. it's essential to produce economical Quality-of-Service (QoS) support during this quite networks [1]. Modern wireless communication is interference-limited. as a result of the published nature, what arrives at the receiver could be a composite signal consisting of all near-by transmissions. However, the receiver tries to decode only 1 transmission by concerning all the others as interference and noise. once the arrivals of multiple transmissions overlap, collision happens and also the reception fails. There are 2 major ways in which to combat the interference. the primary is interference avoidance, that is at the high layers to rearrange the transmission to avoid the harmful interference. this manner is simple to adopt however inherently unable to produce high output. several recent works show that, even with excellent network coordination, the performance remains poor [1]. The second method is to embrace the interference, i.e., all packets in a very composite signal are decoded. Such capability of multiple packet reception (MPR) could be a important progress in signal processing. Recently, theoretical analysis [2, 3] has verified the effectiveness of MPR.

II. LITERATURE SURVEY

[1] "Bandwidth-Aware High-Throughput Routing with Successive Interference Cancellation in Multihop Wireless Networks", in this paper given a unique routing protocol, known as BARS, that's bandwidth-aware and would actively explore set opportunities for multihop wireless networks. We tend to develop a technique to analytically reason the on the market information measure of a given path with set. we tend to additionally style a distributed heuristic algorithmic rule so the information measure may be calculable by a distributed routing protocol. Then, a routing metric that quantifies the advantages of set in terms of information measure and network resource consumption is intended. Simulation results show that the BARS explores additional set opportunities, and so achieves important output gain over different protocols. Shaohe Lv et. al [2] "Scheduling in Wireless Ad hoc Networks with Successive Interference Cancellation", in this paper planned set may be a easy thanks to perform multipacket reception, programing in unplanned networks with set is nontrivial. the actual fact that the links detected consecutive by set are correlate at the receiver poses key technical challenges. we tend to characterize the new link relation and propose simultaneousness graph to capture the result of set. we tend to show that programing over SG is NP-hard and also the most interference range bounds the performance of highest greedy schemes. 3 policies ar explored to with efficiency construct highest possible schedule. The performance is verified in each simulations exploitation NS-2 and measurements in testbed. Canming Jiang et. al [3] "Squeezing the Most Out of Interference: An Optimization Framework for Joint Interference Exploitation and Avoidance", in this paper given advocated a joint interference exploitation and turning away approach, which mixes the simplest of each worlds whereas avoids each's pitfalls. We tend to mentioned new challenges of such a approach during a multi-hop wireless network and planned a proper improvement framework, with crosslayer formulation of physical, link, and network layers. This framework offered a rather complete style area for set on, with the goal to squeeze the foremost out of interference. Rami Langar et. al [4] "Interferer Link-Aware Routing in Wireless Mesh Networks", in this paper given the advantages to the WMN output that may be gained by anticipating the impact of routing selections, in terms of interference, on the service of resultant incoming connections. we've got shown that attributing continuously the simplest offered route for AN incoming association in terms of information measure and loss rate might deteriorate the standard of the remaining offered resources within the network because of the ensuing interference. Consequently, new incoming connections can expertise poor services and so the entire network output is affected. Xueyuan Su et. al [5] "High-Throughput Routing with Superposition Coding and Successive Interference Cancellation", in this paper planned a routing metric iETT and a routing protocol S3 for WMNs, to require advantage of physical layer writing techniques for prime network output. iETT includes the interference-awareness property and provides an easy method of measurement the potential gains of applying each techniques. The S3 protocol works in 3 steps to explore the writing opportunities. Experimental results supported antelope radio platform ensure the effectiveness of the planned protocol. Important enhancements in network output are determined in each single-path and multi-path routing situations. Souvik Sen et. al [6] "Successive Interference Cancellation: Carving out MAC Layer Opportunities", in this paper planned that the advances in rate adaptation limit the scope of potential gains from set.

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III. THEORY

In wireless multi-hop networks, nodes communicate with one another using wireless channels and don't have the requirement for common infrastructure or centralized management. Nodes might cooperate with one another by forwarding or relaying every others' packets, probably involving several intermediate relay nodes. This permits nodes that can't hear one another directly to communicate over intermediate relays while not increasing transmission power. Such multi-hop relaying could be a very promising resolution for increasing output and providing coverage for a large physical space. By using many intermediate nodes, the sender will reduce transmission power so limiting interference effects and enabling spacial reuse of frequency bands. In ad-hoc networks, the medium is shared and nodes prepare access to the medium in a very distributed method independent of their current traffic demand. Specifically given normal ad-hoc routing protocols that attempt to minimize relaying nodes on the path, nodes nearer to the network centre are a lot of probably to become a relay node. This has the inherent disadvantage that a node that is a relay node for transmissions of multiple neighboring nodes is liable to become a performance bottleneck. Because it is important to know performance of such relay networks, the next sub section provides a summary on performance analysis of a relay node. Successive interference cancellation (SIC), as mentioned earlier, is that the ability to decode data related to the individual signals from their combined superimposed signal. It's usually expected that the capability of a wireless channel are often improved considerably with the help of sic. We tend to have an interest in characterizing the extent of the gains potential with sic, and the way the gains relate to the relative strengths of the received signals.

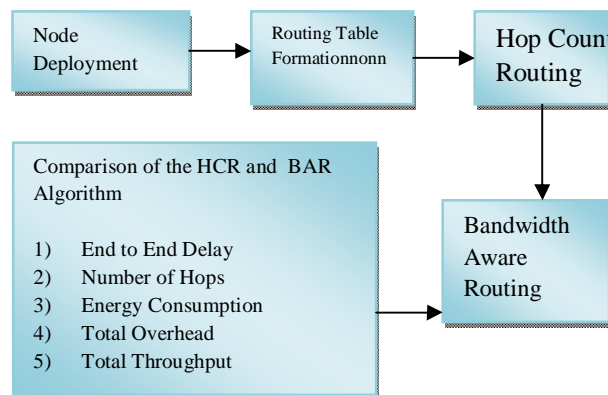


Fig.1: Methodology

IV. METHOD

Node Deployment:

The Node deployment is that the algorithmic rule that is used to position the nodes within the 8 totally different regions and every of the regions contain a minimum of 5 nodes.

Routing Table Formation:

This is the module that is used to make the routing tables for the various nodes within the network.

Hop Count Routing Algorithm:

The Hop Count Routing algorithmic rule will be discovered by using Flooding or Broadcasting. Broadcasting is an inevitable operation of route discovery. Although the published by flooding is easy however inefficient and leads to redundant message relays. This successively over use of limited network resources like channel node energy and bandwidth. The conventional flooding theme is cause high retransmissions that result in packet collisions and media congestion which will considerably degrade the network performance and output.

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Bandwidth Aware Routing:

The bandwidth aware routing algorithmic rule initial finds the one hop neighbors then every of the node acts sort of a supply node. When finding the neighbor sets the node that has lowest bandwidth Aware sic value is chosen. This method is continual till threshold time expires or till destination is reached. Once the time expires min hop routing algorithmic rule triggers that finds the ultimate link to destination. Like that multiple routes are discovered. Then the route that has lowest BASIC value is chosen because the best route.

Comparison:

This module is used to compare the 2 route discovery protocols specifically HCR and bandwidth Aware sic algorithmic rule with relation to numerous parameters.

End to End Delay:

End to end Delay is that the time taken for the RREQ to travel from the supply node to destination node then sends back the RRPLY from destination node to supply node.

$$E2E_{delay} = t_{stop} - t_{start}$$

Where

t_{stop} = This is the Time at which RRPLY is received

t_{start} = This is the Time at which RREQ is sent

Number of Hops:

The range of intermediate links from the supply node to destination node is termed Number of Hops.

Energy Consumption

The energy wasted for delivering the packets from the supply node to destination node. the total energy consumption is given as follows

$$TE_c = \sum_{i=1}^l E_i$$

Where,

l = number of links

E_i = Energy consumed by the i^{th} link

The energy consumed by the i^{th} link given by

$$E_c = 2E_{tx} + E_{amp} d^\gamma$$

E_{tx} = energy required for data transmission

E_{amp} = energy required for data generation

d = distance between two intermediate nodes

γ = environment factor

$$0.1 \leq \gamma \leq 1$$

The Standard environment factor

Total Overhead:

The number of control packets transmitted in the network.

Total Throughput:

The total number of application layer data bits successfully transmitted in the network per second.

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V. RESULT

In this paper present simulation results and compares the performance of routing protocol with some existing ones in terms of throughput.

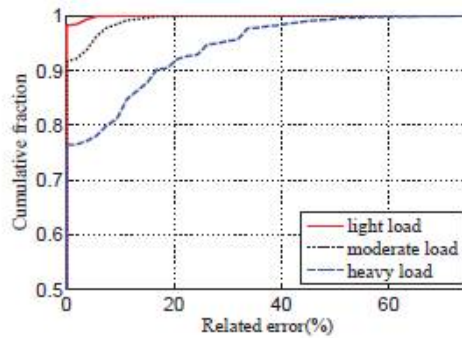


Fig. 2 CDF of the estimation errors of our heuristic algorithm for the three scenarios

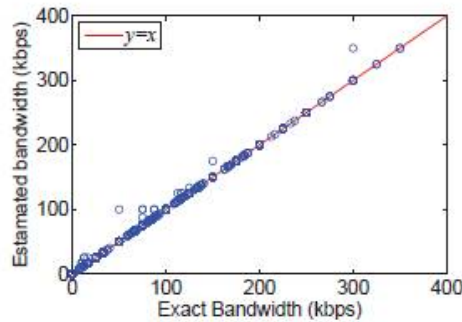


Fig. 3 A comparison between exact bandwidth and estimated bandwidth obtained by the decentralized computation with all the feasible link sets in the heavy load scenario

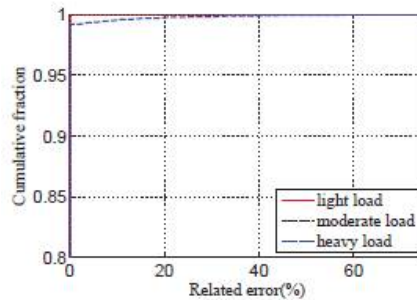


Fig.4 CDF of the estimation errors brought from the decentralized computation for the three scenarios

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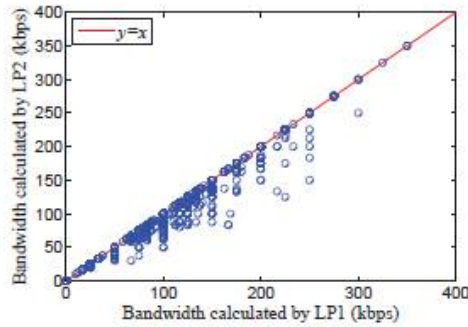


Fig.5 A comparison between sub path bandwidth computed with all the feasible link sets (calculated by LP1) and computed with partial feasible link sets (calculated by LP2) in the heavy load scenario

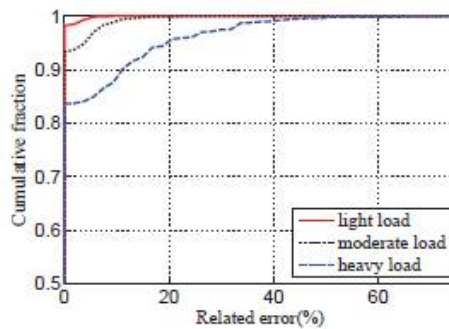


Fig.6 CDF of the estimation errors brought from using partial feasible link sets for the three scenarios

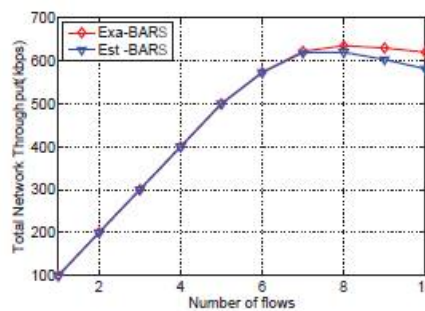


Fig.7 Aggregate Flow Throughput v.s. Number of flows

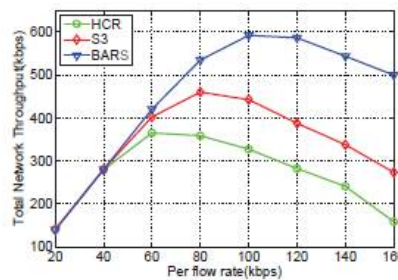


Fig.8 Aggregate Flow Throughput v.s. Per flow rate.

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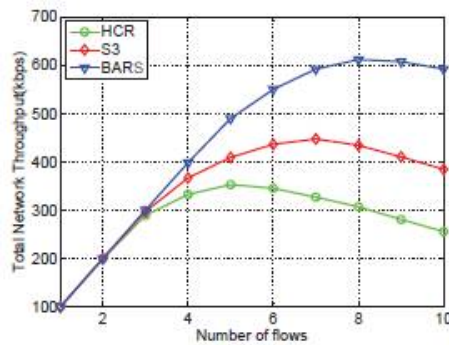


Fig.9 Aggregate Flow Throughput v.s. Number of flows.

TABLE I

SIC RATIO OF THE THREE ROUTING PROTOCOLS

HCR	S3	BARS
20%	32.5%	40.2%

The performance gain, we define SIC ratio as the ratio of the number of transmissions using SIC to the total number of transmissions. Table I shows the SIC ratio of the three different routings In this paper presents HCR has the lowest SIC ratio because it does not take the effect of SIC into account. The SIC ratio of the BARS is about 35.6% more than S3. This is because S3 does not consider the opportunities that SIC enable the receiver to partially cancel the interfering signals. Compared with the throughput performance of the three protocols, it can be find that throughput gain brought by SIC is essentially correlated with the SIC ratio. Therefore, an SIC aware routing protocol is indispensable for improving end-to-end throughput with SIC.

VI. CONCLUSION

In this paper result analysis of Bandwidth-Aware High Throughput Routing with Successive Interference Cancellation in Multihop Wireless Networks which gives above results, which shows the complication of the previous methods should be enhanced. We design a distributed heuristic algorithm so that the bandwidth can be estimated by a distributed routing protocol. We develop a methodology to analytically compute the available bandwidth of a given path with SIC.

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